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GENERAL VIEW OF SEWAGE PURIFICATION PLANT. PRIMARY SEDIMENTATION BASINS IN FOREGROUND

SPRINKLING FILTER PLANT FOR SUBURBAN COMMUNITY

Filters Enclosed in Building — Provision for Two Hundred Thousand Gallons a Day—Preliminary and Final Sedimentation Basins and Dosing Tanks—Details of the Plan—Cost of Construction

By PAUL HANSEN, Assoc. Mem. Am. Soc. C.E., State Sanitary Engineer of Kentucky

In June, 1910, there was completed and placed in operation a small sewage purification plant of the sprinkling filter type at the village of College Hill, a residence suburb of the City of Cincinnati. This little installation involves no new principles or novelties of design not hitherto known to the sanitary engineering profession, but it does present a rather interesting object lesson in the solution of a sewage disposal problem.

GENERAL CONSIDERATIONS

The village of College Hill lies about one mile to the northward of the northern corporation line of Cincinnati. It is built on a rather level tableland of the highlands bordering the valley of Mill Creek, a fairly large stream which discharges into the Ohio River within the Cincinnati borders. The natural drainage of College Hill is toward the southward into a number of deep ravines which have hilly slopes and are generally sparsely inhabited. Most of the drainage within the built-up portion of the village may be readily conducted toward one of these ravines, which reaches nearly to the central part of the village. A small water course (see photo, page 2) occupies

this ravine, and after flowing a distance of about two and one-half miles discharges into Mill Creek. The ravine has been taken advantage of for the location of an electric traction line which follows the general course of the stream.

The present population of College Hill is estimated at 2,000. In the way of public improvements there is a public water supply obtained from the Cincinnati Water Works, a number of miles of good sidewalks, and many roadways paved with well constructed macadam. The village in general presents a very picturesque and attractive appearance and is one of the most popular of the more recently developed suburban towns.

One of the necessary requirements of a suburban community near Cincinnati is a good sanitary sewerage system, and it was to meet this requirement that early in 1908 the village authorities took active steps toward the installation of such a system.

SEWERAGE SYSTEM

While the sewage purification works form the subject matter of this article, yet a brief description of the sewerage system



STREAM WHICH RECEIVES EFFLUENT

proper is essential to an understanding of certain phases of the purification problem. The sewers are, of course, built upon the strictly separate plan, that is to say, all wastes that are not offensively putrescible are conveyed through storm water drains to the nearest water course, while only house sewage is permitted to enter the sanitary sewers. The sanitary system is designed to ultimately meet the demands of a population of 10,000, but the present installation covers only about half of the territory that may ultimately be covered. The design is such that all the sewage is conveyed by gravity into a main trunk sewer occupying the ravine above described.

While the sanitary sewerage system is, for the most part, substantially constructed, no attempt was made to underdrain the sewers in wet ground. For this reason the sewers receive a considerable quantity of ground water leakage which averages about 30,000 gallons per 24 hours. It seems that most of the ground water enters at one point on the main sewer and may, therefore, be eliminated at comparatively small expense. The village officials in charge of the sewerage system have had great difficulty on account of numerous rain water leader connections to the sanitary sewers, and a determined effort is now being made to eliminate these connections.

SEWAGE PURIFICATION

Owing to the inadequacy of the small stream occupying the ravine into which the main trunk sewer is carried for sufficiently diluting the sewage flow to prevent a nuisance, it was at once evident that sewage purification works were necessary. The problem of selecting the type of purification works now presented itself, and it was soon found that the peculiar local conditions would constitute the determining factors in the solution of this problem.

Based upon experience in other Ohio villages similarly located, the assumption was made that purification works capable of caring for the sewage of 2,000 persons tributary to the sewers and representing a sewage flow of perhaps 200,000 gallons per 24 hours would meet the needs of the village for about ten years. The growth of the village, however, has been so very rapid and the general desire for sewerage facilities is so great that it now appears that a safer assumption would have placed the time required to make the sewerage system available to 2,000 persons at five years instead of ten years. The quantity of sewage flow will probably also exceed the assumed quantity on account of ground water leakage, permitted by the absence of underdrains, even though the worst places be reconstructed. In considering possible future extensions it was assumed that the ultimate population that can be made tributary to the sewers is 10,000, representing a sewage flow of 1,000,000 gallons per day. It is not expected that these conditions will obtain before fifty years hence, and moreover, before this period has expired connections will have

been made with the steadily widening sewerage system of the City of Cincinnati. Consequently a doubling or trebling of the present installation is all that need be looked forward to.

Having determined upon the capacity of the first installation and the possibility of future extensions it next became necessary to decide in a general way upon the degree of purification that must be obtained in order to place limiting conditions upon the type of purification devices that might be considered. Fortunately conditions were such that no rigorous restrictions were imposed by this aspect of the problem. While the stream which receives the sewage effluent is small, yet it has a rapid fall so as to cause the water to pass over a series of small cascades. Further the ravine contains but a few houses, and these are at considerable distance from the stream, nor is the water of the stream used for cattle watering or any other purpose until it has reached a distance of two and one-half miles from the village. Such facts as these led to the conclusion that all that could be reasonably demanded was a merely non-putrescible effluent practically free from suspended matter.

In considering the type of plant it was, of course, recognized that intermittent sand filtration for a community of this size and character would prove the most all around satisfactory method of purification that could be adopted, but this method was ruled out of consideration almost at the start, for the reason that there was no site available which could be utilized without involving an excessive amount of excavation and grading, and this mostly in difficult material.

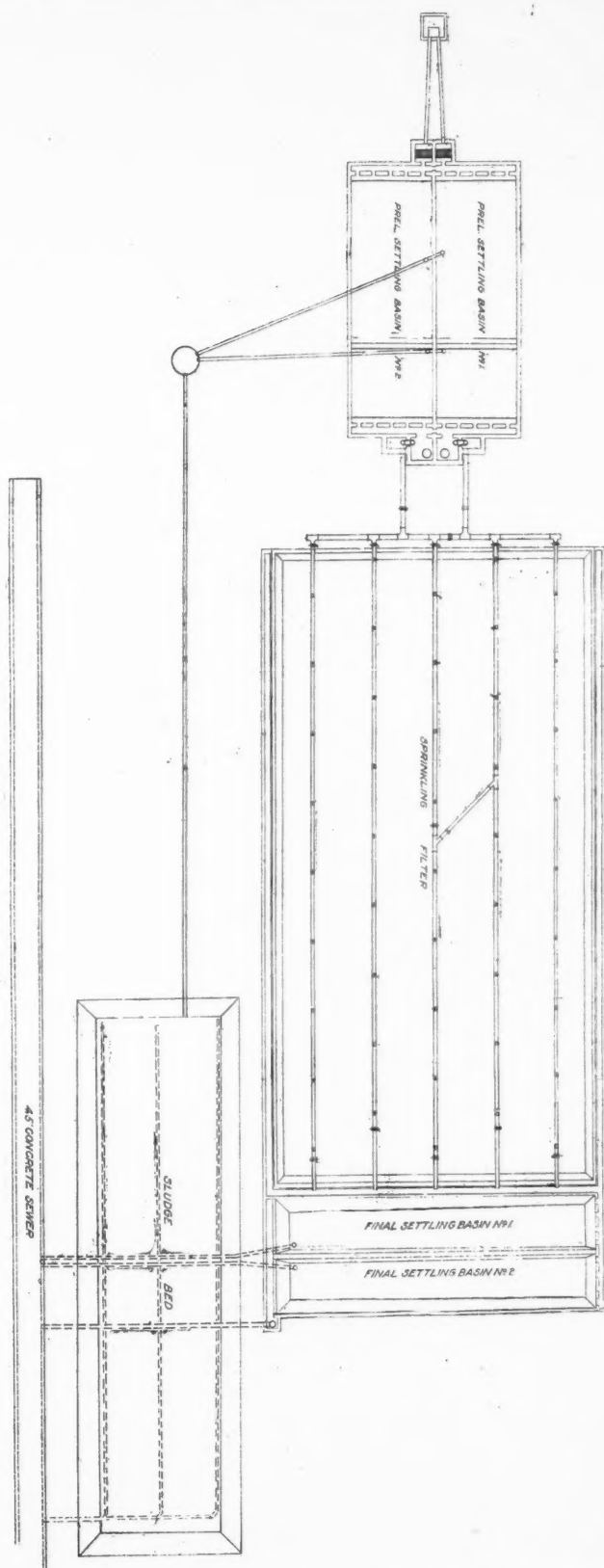
The use of contact beds, assuming the necessity of using one-tenth acre of bed 5 ft. in depth, for each 500 or 600 persons tributary to the sewers, was considered as practicable, but even this involved a large amount of excavating and grading. Moreover, there had to be taken into consideration the difficulty of conveying materials during construction to any available site, for this involved a long and difficult wagon haul from the nearest steam railroad siding.

While sprinkling or percolating filters are not likely to give best results for small communities, owing to their relative complexity of design as compared with intermittent sand filtration and contact beds, yet it appeared that this type of plant was the only one that could be built without excessive expense. There were several considerations which further encouraged the adoption of sprinkling or percolating filters. First was the fact that the village of College Hill is a moderately wealthy community and can afford to employ a competent person to operate the plant; and, moreover, the character of the citizenship is such that public utilities are not likely to suffer neglect. In the second place, a recently enacted law enables the State Board of Health to effectively demand the proper operation of all water purification and sewage purification works. All things considered, therefore, a sprinkling filter plant was deemed most suitable.

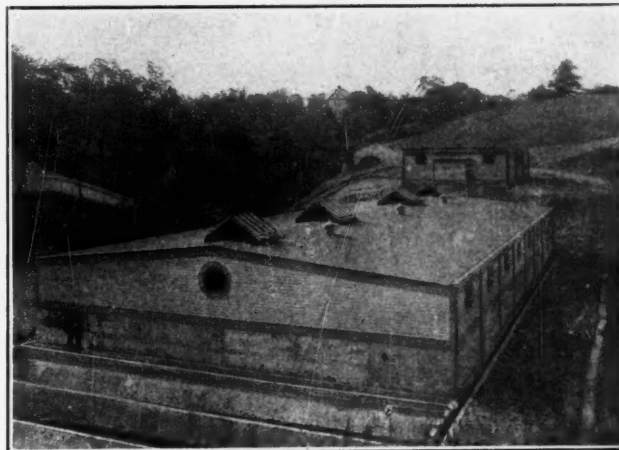
There was selected as the most suitable site for the construction of the purification works a plot of land near the upper end of the ravine, at a point where one side of the ravine has a comparatively gentle slope. This site is not a good one in one important respect, namely: it is rather too near the buildings of a sanatorium, the nearest of these buildings being about 300 ft. distant. In addition there are twenty residences within a radius of 1,000 feet of the plant. While it was doubtful whether odors from contact beds or intermittent sand filters would be carried 300 feet, it was a certainty that odors from sprinkling filters would be carried a much greater distance than this. Computation, however, showed that this type of plant on the site selected would still prove by far the most economical, even though it became necessary to cover the filters. Accordingly superstructures were decided upon which thus far have been eminently successful in confining odors to the immediate neighborhood of the plant. The striking feature of the superstructures is that while they are not unreasonably expensive, they have been designed with such artistic skill as to render this plant one of the most sightly of the smaller plants in the country.

GENERAL ARRANGEMENT OF PURIFICATION WORKS

Before proceeding with a description of the several parts of the purification works it will be well to make a brief statement of the general arrangement. The plant occupies an area of about 210 ft. by 65 ft. and lies in such a position that its capacity may be increased in the future by moderate additions on either side and by longitudinal extensions. Sewage enters the plant by gravity from the main trunk sewer and is received into one or both of two small screen chambers. After screening, the sewage passes to one or both of two sedimentation tanks and thence into syphon chambers, from which it is rapidly discharged at intervals by means of automatic syphonic



GENERAL PLAN OF PURIFICATION PLANT



PURIFICATION PLANT. FINAL SETTLING BASINS AND FILTER HOUSE IN FOREGROUND

apparatus. The discharge of the syphonic apparatus is into so-called equalizing chambers, which are of such shape as to equalize the distribution of the sewage over the surface of the filter beds by the sprinkling nozzles. The effluent from the sprinkling filter is collected in suitable channels and conveyed to final sedimentation basins designed to retain the coarser suspended matters. A sludge bed is provided for draining and drying the sludge from the primary sedimentation tanks.

Screen Chambers. The two screen chambers are each 3 ft. by 3 ft. in plan and 2 ft. 6 in. in depth, inside dimensions. Each chamber is provided with two screens placed at an angle of 60 degrees to the horizontal and sloping backward from the incoming sewage. These screens are built of wrought iron bars of $\frac{3}{8}$ -in. circular sections and spaced with $\frac{3}{8}$ -in. clear openings. The design of the screen chambers might have been improved upon by making them considerably longer, thus giving greater accessibility to the screens. A valuable accessory to screen chambers of this sort is stop plank grooves which may serve to support a measuring weir.

Preliminary Sedimentation Basins. The two preliminary sedimentation basins are built of reinforced concrete, each 45 feet long, 15 feet wide and 10 feet in total depth. The depth to the flow line is 7 feet 6 inches. The basins thus each have a capacity of 50,000 gallons, representing a flow period of 6 hours or a total flow period of 12 hours based upon the nominal capacity of the plant. The tanks involve no novel features of arrangement, but the design of the reinforced concrete is such as to require for the structure a minimum of excavation. Provision is made for distributing the inflow evenly across the width of the tanks by means of distributing channels provided with a number of gate-controlled openings into the tanks and equi-distantly spaced. A similar channel is provided for drawing off the sewage from the outlet end. The distribution of sewage across the tanks is further assisted by hanging baffles placed 2 feet from inlet and outlet ends. At a point two-thirds distant from the inlet to the outlet ends is placed one hanging and one submerged baffle within a foot of each other for the purpose of intercepting sludge and scum and thereby preventing in a measure ebullition near the outlet of the tanks. Suitable sludge drains are provided near the center of the bottoms of the tanks. In order to prevent the dissemination of odors the tanks are covered with a superstructure which is designed primarily to give ready accessibility to all parts of the tanks as well as the automatic apparatus. The satisfactory appearance of the exterior of the superstructure has already been commented upon.

Dosing Tanks. There are two dosing tanks each 4 feet by 4 feet in plan and 2 feet 6 inches in depth to the flow line; the capacity of each is thus 300 gallons. Based upon the average rate of flow when the plant is operating at its nominal capacity, these tanks would be filled every 5.4 minutes when both are in use, or once in every 2.7 minutes when one is in use. Under ordinary operating conditions it is proposed that

only one tank be used and the other held in reserve for use in case of break-down or stoppage. In order to permit a free discharge of the syphons uninfluenced by the back pressure from the sprinkling nozzles on the filters, and furthermore to assist in the equal distribution of the sewage by the nozzles over the surface of the filter, an equalizing chamber was provided for receiving the syphon discharge from each dosing chamber. The syphonic apparatus used is that manufactured by the Merritt Company of Philadelphia, Pa.

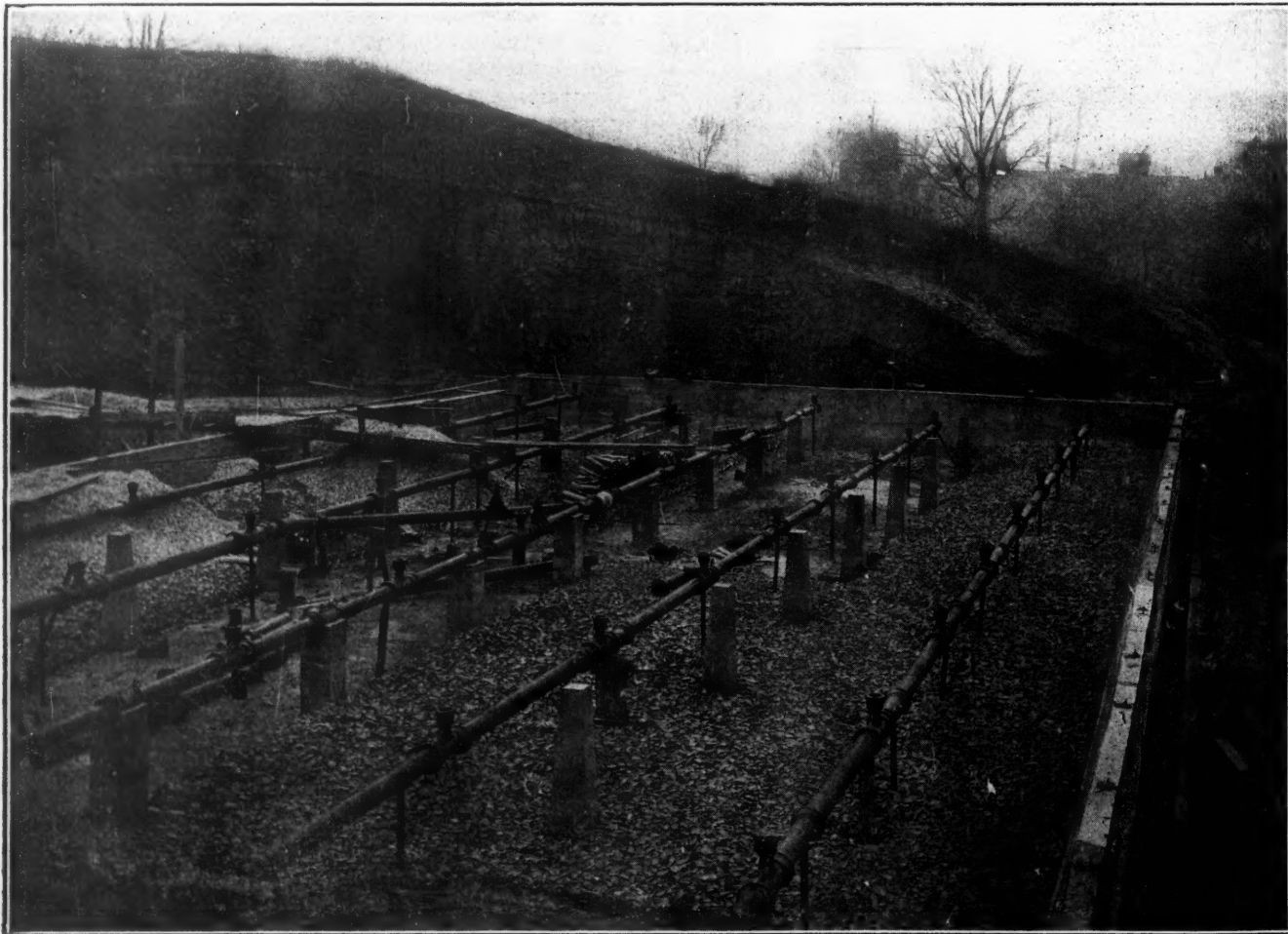
The proper shape for the equalizing chamber was a matter which could not be definitely settled without some preliminary experimentation. Accordingly, under the general direction of the writer, a small experimental plant was devised which comprised in prototype a small dosing chamber and an equalizing chamber of sufficient size to supply a single nozzle. One side of the equalizing chamber was made adjustable in order to secure some indication of the best form to give this chamber. The funds and time available did not permit of these experiments being exhaustive in character, but they did serve to furnish practical assistance in arriving at the design ultimately to be adopted. The above experiments also were utilized to obtain data which would assist in the selection of the type of nozzle to be used. Inasmuch as the experimental methods and results are of considerable interest they will be made the subject of another article by Mr. W. H. Dittoe, Assistant Engineer of the Ohio State Board of Health, under whose immediate supervision the experiments were carried out.

Sprinkling Filter. The sprinkling filter is rectangular in plan, 115 feet long and 60 feet wide, which gives an area of 6,900 square feet or 0.158 acre. Based upon the nominal capacity of the plant, namely, a capacity for treating the sewage of 2,000 persons, the above area would represent one acre for each 12,660 persons tributary to the sewers. The filtering material, for the most part, consists of broken stone such as will pass a 3 inch ring and be retained by a $\frac{1}{2}$ inch ring. The lower

12 inches of filtering material is made somewhat coarser than this to facilitate drainage. The total depth of the filtering material is 5 feet. The bottom of the filter consists of a concrete floor 4 inches in thickness with a slope of one foot in 90 in either direction from a central ridge.

The underdrains consist of 6-inch half tile 2 feet in length and provided with notches at the sides to permit the ready entrance of the effluent. The design of the underdrains is quite similar to that used at Columbus, O., but the ends of the pipe are provided with half bells which permits of an over lapping of the joints which facilitates obtaining alignment of the pipe and possibly prevents more or less solid material from entering them. Unfortunately the mistake was made, of having the tile burnt after they were split. This resulted in excessive warping so that but few of the tile lie with an even bearing. While it is likely that a great many of the tile will be broken by the weight of the stone, it is not probable that underdrainage will be greatly interfered with since the effect of the warping will be to cause the pipes to break transversely rather than longitudinally. To secure the best results with half tile underdrains in sprinkling filters the writer would recommend floating the surface of the floor of the filter with $\frac{1}{2}$ to $\frac{3}{4}$ of an inch of cement mortar and, placing the drain tile while the cement is still soft, pressing the edges down into the cement until they have an even bearing. This method not only insures the drain tile against breakage by superincumbent weight but also holds them firmly in alignment while the filtering material is being placed and provides smooth channels for carrying off the effluent. By all means the tile should be burnt whole and split afterwards.

The walls surrounding the filter are made of concrete. The underdrains are carried directly under the wall and discharged into open gutters extending longitudinally along either side of the filter. This arrangement permits of accessibility to the under drains for cleaning by flushing or other means.



SPRINKLING FILTER DURING CONSTRUCTION

The sewage from the equalizing chamber is conveyed to the filter through a system of cast iron pipe. The main pipe leading from the equalizing chambers are 10 inches in diameter; these in turn enter a header, also 10 inches in diameter, which extends across the upper end of the filter just outside the filter wall. Leading off from this header are five lines of 6-inch and 8-inch cast iron lateral pipe extending longitudinally across the filter bed and at a depth of 12 inches below the surface of the stone. The laterals have a spacing, center to center, of 11 feet 3 inches. At intervals of 12 feet 6 inches along these are placed uprights which rise to a few inches above the filtering material and support the sprinkling nozzles. The spacing of the nozzles brought about by the above described arrangement brings the nozzles approximately at the vertices of the equilateral triangles into which the bed is thus divided. The several laterals are provided with valves at both ends. Those next the headers will permit the laterals to be used independently, and those at the opposite ends permit of the laterals being flushed out. It may be mentioned that the laterals extend through the filter walls, as shown in the accompanying photograph. A valve-controlled cross-over between the central and one of the adjacent laterals permits an even division of the filter into two parts. A valve in the header permits the independent operation of the two equalizing chambers.

The elevation of the orifices of the sprinkling nozzles is such that they will operate under a head varying from a maximum of $7\frac{1}{2}$ feet down to zero. The equalizing chamber has its bottom 2 feet above the nozzles, so that practically the entire discharge through the nozzles takes place above this head.

Final Sedimentation Basins. The effluent from the sprinkling filter is conveyed by means of the troughs already mentioned to the final sedimentation basins. There are two of these basins, built of concrete, each 59 feet 6 inches long, 10 feet wide and 4 feet 6 inches deep to the flow line. The basins each have a capacity, making due allowance for sloping sides, of 7,000 gallons, thus giving a total capacity of 14,000 gallons, which represents a flow period, based upon the nominal capacity of the plant, of a little over 2 hours. The effluent is admitted to one end of the sedimentation basins by means of a distributing channel having four rectangular 8-inch openings equi-distantly spaced across the width of each basin. The effluent is drawn off at the opposite end over weirs extending the entire width of the basins. The flow from the weirs falls into a collecting trough of concrete which in turn discharges into a 12-inch vitrified pipe which conveys the sewage to the creek. Provision was made for cleaning the basins by placing 6-inch



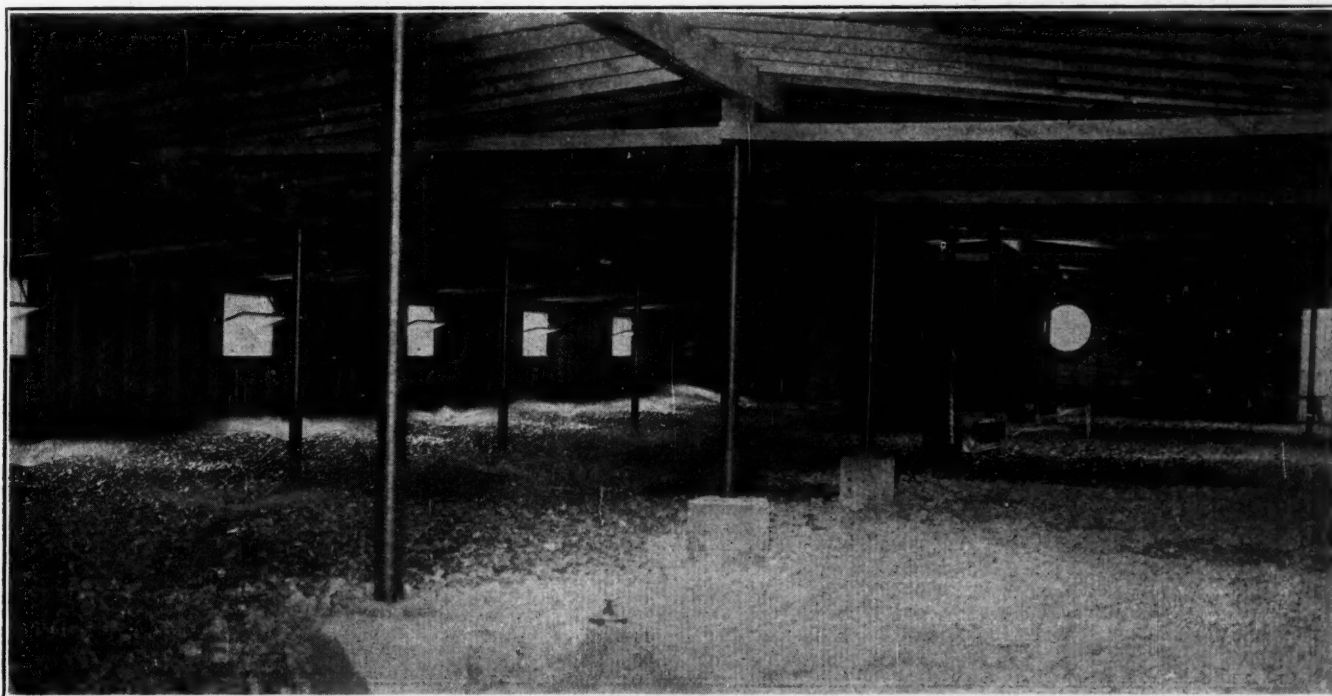
SPRINKLING FILTER. WALLS AND SOME PIERS IN PLACE

sludge outlets in the bottoms, which outlets in turn have connecting pipes leading to the creek. Cleaning of the final sedimentation basins will not be attempted except at times when the stream is carrying a large volume of water.

Sludge Bed. The sludge bed is located near the lower end and at one side of the purification works. This bed is simply a sand filter constructed essentially the same as would be an intermittent sewage filter. It is 30 feet by 100 feet in plan at the sand line, thus giving it an area of 3,000 square feet. This area is such that it may receive the entire contents of one of the preliminary sedimentation tanks without covering it to a depth greater than $1\frac{3}{4}$ feet. If the bed is kept in proper condition the thin liquid will pass through in the course of a few hours and leave the sludge to dry. It is to be expected that the process of removing sludge from the preliminary sedimentation tanks will be accompanied by some odor, but if the process is well managed, this odor need not result in an objectionable nuisance.

OPERATION.

At the present time it is estimated that there are 800 persons tributary to the sewerage system at College Hill and the flow, as measured on Nov. 28th, 1910, was 92,400 gallons per 24 hours. The maximum rate observed was 105,000 gallons per 24 hours and the minimum 82,000. As these measurements extended but from 1 P. M. to 4 P. M. the actual minimum for the day was not obtained, but this minimum presumably occurred during the early morning hours. When it is considered that about 30,000 gallons of the day's flow is clear ground water the comparative weakness of the crude sewage as shown in the accompanying table of analyses will be under-



INTERIOR OF SPRINKLING FILTER HOUSE. SPRINKLERS IN OPERATION

stood. Three-fifths of the filter area was in use at the time of the test and while this does not represent a rate of treatment for which the plant was nominally designed yet the results as indicated by the analyses may be taken as an indication that the plant is good for a much heavier burden than is now being imposed upon it. The analyses of the water from the stream into which the effluent is discharged are interesting as showing the practically negligible effect which the sewage has on the character of the water.

COSTS.

The total cost of the sewerage system proper was \$44,522.00. The cost of the disposal works was \$20,700.00. The unit costs of the purification works as presented in the bid of the contractor are given in the following table:

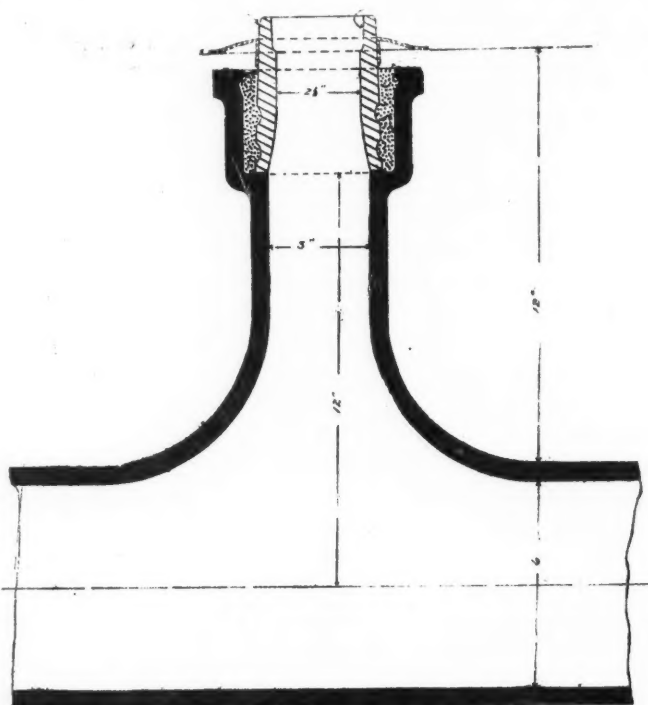
STATEMENT OF COST OF SEWAGE DISPOSAL PLANT

10,300 cu. yds. grading, at 49c. per cu. yd.	\$5,047.00
1,890 cu. yds. broken stone, at 52c. per cu. yd.	982.80
317 cu. yds. sand, at \$1.60 per cu. yd.	507.20
404 cu. yds. plain concrete, at \$4.55 per cu. yd.	1,838.20
158 cu. yds. reinforced concrete, at \$6.50 per cu. yd.	1,027.00
507 lin. ft. 6-in. vitrified pipe, at 21c. per lin. ft.	106.47
161 lin. ft. 8-in. vitrified pipe, at 32c. per lin. ft.	51.52
334 lin. ft. 12-in. vitrified pipe, at 55c. per lin. ft.	183.70
7,000 lin. ft. 6-in. split pipe, at 10c. per cu. yd.	700.00
31.61 tons cast iron pipe, at \$49 per ton	1,548.89
7.50 tons special castings, at \$25 per ton	187.50
7.50 tons special castings, at \$50 per ton	375.00
(Allowance for error in bid.)	
1 fire hydrant, at \$19 each	19.00
6 8-in. shear valves, at \$18 each	108.00
20 6-in. shear valves, at \$13.75 each	275.00
3 10-in. gate valves, at \$47 each	141.00
11 6-in. gate valves, at \$18 each	198.00
2 extra valves, at \$34 each	68.00
6 8-in. flap valves, at \$17.75 each	106.50
1 superstructure for settling basin, at \$1,415 each	1,415.00
1 superstructure for filter bed, at \$3,114 each	3,114.00
2 manholes, round, at \$35 each	70.00
4 screens, at \$14.50 each	58.00
6 baffles, at \$30 each	180.00
1 sludge distributor, at \$40 each	40.00
5 cast iron covers, at \$12.50 each	62.50
45 sq. ft. cement walk, at 16c. per sq. ft.	7.20
50 sq. ft. cement steps, at 29c. per sq. ft.	14.50
EXTRA BILLS ALLOWED	215.10
TOTAL CONTRACT ITEMS	\$18,647.08
Eng. and supt. construction	1,118.82
Topographical survey, 10-acre tract	240.00
Nozzles	200.00
Dosing siphons	400.00
Printing, etc.	94.10
TOTAL COST OF IMPROVEMENT	\$20,700.00

An examination of the above figures will show that the bid

was unbalanced—the price for concrete is especially low. It may be noted that the contract price was a close one and that in all probability the contractor lost two or three thousand dollars. Moreover, the contractor, after the death of one member of the firm, proved unenterprising and it was with great difficulty that the engineers could force him to complete the work. It is unfortunate also that some of the work suffered in quality, due to the inefficiency of the contractors; but except for the placing of some soft and friable stone in the filter beds it is not likely that any of these defects in construction will materially affect the results obtainable.

Mr. J. A. Stewart of Cincinnati was consulting engineer, and Mr. C. A. Riggs, also of Cincinnati, was assistant engineer in direct charge of the work. The contractors were Meridith & Dekeback of Cincinnati. Some of the early work in connection with preliminary inspections and preparation of plans was done in co-operation with the writer, then of the engineering department of the Ohio State Board of Health.



6 x 3 cast-iron tee, carrying in bell a bitumenized nozzle tip with tapered opening for nozzle. Tip is fastened in bell with water-proof joint and provided with drip bib

Results of Analysis of Sewage, Sewage Effluent and Creek Water at College Hill, Ohio

Field Number	No. 1 Composite crude sewage	No. 2 Preliminary sedimentation effluent	No. 3 Filter effluent	No. 4 Final sedimentation effluent	No. 5 Stream above outlet	No. 6 Stream below outlet	No. 7 Stream 2,000 ft. below effluent outlet
No. of sample	1078	1079	1080	1081	1082	1083	1084
Temperature	48	50	40	38	38	38	38
Color	45	36	36	35	18	32	35
Turbidity	250	110	68	43	25	22	22
Sediment	Distinct	Distinct	Distinct	Distinct	Slight	Trace	Trace
Odor	Sewage	Strong sewage	Mouldy	Earthy	Earthy	Earthy	Stt. Earthy
Dissolved oxygen	2.4	0.0	4.5	4.5	5.7	5.5	6.0
Oxygen consumed	74.	27.75	19.	13.2	6.9	10.9	9.3
Total Kjeldahl	34.5	33.3	15.6	10.3	4.	6.9	5.9
Nitrogen as:							
Am. free	12.	13.	8.	5.	.14	4.2	3.6
Nitrites	.040	.300	.240	.240	.008	.200	.150
Nitrates	.4	.4	4.4	5.6	1.6	5.	4.6
Chlorine	62.	51.	54.	53.	35.	47.	45.
Alkalinity	288.	248.	216.	206.	260.	220.	216.
Total solids	915.	654.	660.	636.	593.	613.	605.
Loss on ignition	236.	104.	111.	142.	113.	100.	91.
Dissolved solids	743.	597.	606.	607.	586.	595.	585.
Loss on ignition	125.	79.	94.	95.	85.	91.	86.
No. bacteria per c.c.	...	...	...	730,000	90,000	120,000	48,000
Colon bacillus	...	...	...	Pos., 1 c.c.	Pos., 1 c.c.	Pos., 1 c.c.	Pos., 1 c.c.

SEWERAGE AND SEWAGE DISPOSAL

Materials Used for Sewers and Joints—Pipe Tests—Amount of Sewage Purification Necessary—Methods Available—Possibilities and Limitations of Each—Most Recent Developments

IN the line of sewerage, aside from sewage disposal, there has been little change in ideas during the past few years. The removal of household wastes in underground pipes by gravity will undoubtedly continue to be practically the only method employed for many years to come; a very potent reason for this, if there were no other, being that the ever-increasing use of water in city buildings calls for conduits for removing it after such use (by which time it has become more or less polluted), and for this the ordinary water carriage sewer seems to be the best practicable means.

A generation ago there was a public scare about the dangers of sewer gas, but investigations made in the light of more advanced scientific knowledge indicated that this was largely imaginary. Again about a year or so ago an English investigator announced that he had learned by experiments that pathogenic bacteria could be carried into dwellings through house connections with sewer air. Further and apparently more practical experiments indicated, however, that the danger of this was infinitesimal. It appears from our present knowledge that sewer air is as dangerous as, but no more so than, other foul air; but it is objectionable and should certainly be excluded from all residences. A much greater danger lies in the possibility of flies coming in contact with excremental matter in sewers or elsewhere, since thus disease germs may become attached to the flies and be brought into contact with human food. This furnishes a very powerful argument in favor of sewerage systems in all communities.

In the construction of pipe sewers, vitrified clay is the standard, but there is an increasing tendency toward the use of concrete in the larger sizes, and in this reinforcement is being employed with more intelligence as its possibilities and limitations are more generally understood. For the smaller sizes of sewers—say, up to 3 or 4 feet in diameter—there appears to be little, if any, economy or other benefit in the use of reinforcement, while the practical difficulties in its use are much greater in these smaller sizes. In the construction of concrete sewers much improvement along the line of economy is noticed, the most important examples being in the use of mixers better adapted to this work and the carrying of the concrete from the mixer to its place in the sewer through troughs or by other labor-saving devices.

The use of reinforced concrete pipe (made outside the trench in 2 to 5-foot sections) is becoming more general, and improvements in its manufacture have been arrived at by experience. The weak place in any pipe sewer is the joint, and concrete sewer pipes have this disadvantage, as compared to monolithic sewer construction. On the other hand, the pipe has the advantage that it can be laid in wet trenches, even those in which water enters under a head, under which conditions monolithic construction is very difficult. In Toronto a tight line of concrete pipe conduit was obtained last year by covering the joints on the outside with alternate layers of building paper and hot tar, and finally with a strip of burlap bound with two iron wires, one on each side of the joint. Several materials for making water-tight joints with vitrified pipe sewers have been placed upon the market, the one which has appeared this year being really a pipe dip composed of vulcanized linseed oil, which is said to have given very promising results in two or three towns. With the increasing number of purification plants and of pumping plants, the matter of water-tight sewers is becoming of more and more importance.

In the specifications for sewer pipe of various kinds, requirements as to smoothness of surface and trueness of form are common, but few contain any requirements as to strength of the pipe. During the past few months committees of two or three societies, notably the Society for Testing Materials, have

been endeavoring to formulate special requirements covering this, and such requirements have already been embodied in the specifications of Brooklyn, N. Y., where they originated, and quite recently in those of one or two other cities. These tests were described in our issue of Feb. 2, 1910.

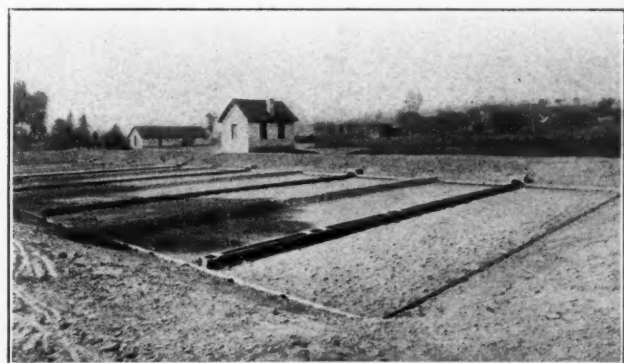
SEWAGE DISPOSAL.

The growth of communities both in size and in number is making more intense the difficulties in the way of disposing of sewage; and especially in view of the advanced stand being taken by more States every year in requiring purification of sewage to a greater or less extent before discharging it into streams.

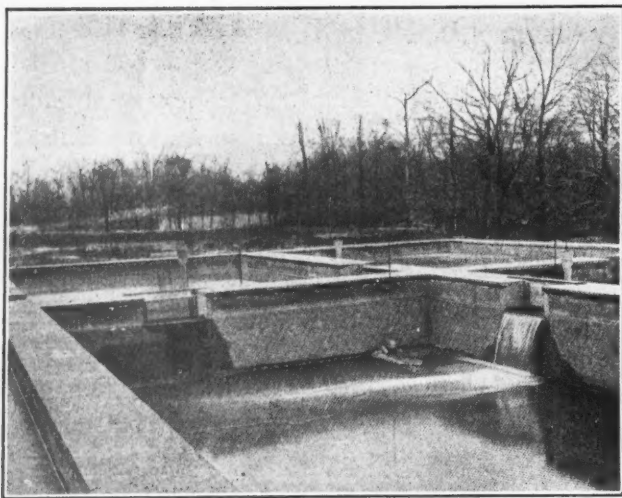
Perhaps the most important and significant development in sewage purification ideas during the past year or so has been the almost unanimous agreement among sanitarians that it is not practicable—perhaps not even so desirable as it was at one time thought to be—to bring sewage effluents to a high degree of purification before being discharged into streams. The consensus of opinion among the leaders in sanitation appears to have practically reached the point foreshadowed in this journal editorially for a year or two past—that the most generally economical and logical treatment of the combined subjects of sewage and water purification was to consider the aim of sewage purification to be the preventing of all nuisance, and looking to the filtration of water supplies for the elimination of pathogenic bacteria or any other causes of disease which might exist in a stream or other source of supply. The old theory that no individual or city had any right to pollute a stream in any way is no more tenable in a densely populated country than that an individual has no right to pollute the air of a public building, although he does so with every breath exhaled.

In the matter of sewage purification a great deal has been done quite recently in the way of clearing the field of misconceptions, of determining the possibilities and limitations of various devices and methods, and of assigning to each of these its proper place in the general field of sewage purification. It is now pretty well realized that there is no one system or plan which is best under all conditions, but that there are a dozen or more of the methods which have been devised during the past twenty-five years which have most excellent features, each of which is probably best under certain conditions.

In general, it may be said that there are three aims in sewage purification—the removal of suspended matter so as to leave a clear effluent; the removal of practically all organic matter so as to give a comparatively pure effluent; and the elimination of pathogenic bacteria. The first is almost always necessary; the second almost never so; the third is necessary under certain



INTERMITTENT FILTER BEDS AT WAUWATOSA, WIS.



GLENVILLE, O., PRECIPITATION TANKS
Coke and sand filters in background. Population, 10,000

conditions, such as the presence of beds of oysters or other shell fish below the outlet, propinquity of water-works intakes, etc. "Purification" as used in connection with sewage should be recognized to mean "removal of impurities" and not "rendering pure." Almost any plant will do the former to a greater or less degree; no process practicable outside of the laboratory can effect the latter. Parties who claim, as some have done during the past year, that they can construct septic tanks which will furnish an effluent suitable for drinking are worthy of no reliance whatever, but are either the greatest of fools or are intentionally deceiving those to whom they are endeavoring to sell their processes.

In too many cases the city official becomes persuaded that a certain purification process, because it is working satisfactorily in or has been advised by experts for a neighboring city, is therefore the one which should be adopted for his own; whereas, as stated above, there is no one method which is best for all cities, and only a study of the conditions affecting the

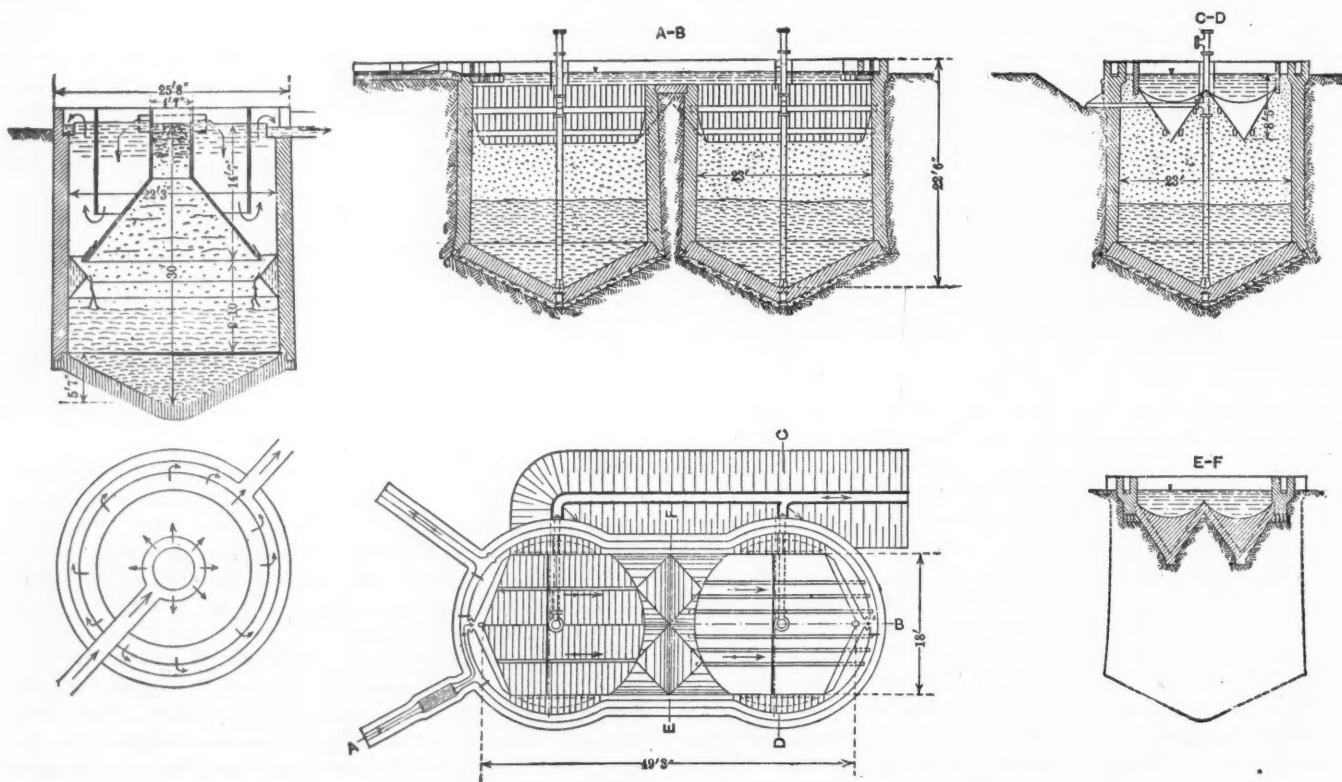
problem in the locality in question can enable even an expert to determine which is best adapted for it.

A greater or less clarification is given by every purification process, but the producing of an effluent even comparatively pure would seem to be practicable only by the use of intermittent sand filters. These require larger areas than are practical for most cities of any size.

The destruction of bacteria, pathogenic and others, can be secured by the use of hypochlorites; also by other agencies which at the present time appear to be less effective and less economical; but it appears to be necessary to remove a considerable proportion of the suspended matter before applying the hypochlorite if favorable results are to be obtained.

For removing suspended matter and delivering a clear and non-putrescible effluent we have available precipitation tanks (including the modifications known as the septic tank, the Emscher tank, etc.), contact beds and sprinkling filters. The last named requires preliminary clarification, its special purpose being that of producing non-putrescibility; while the contact bed works to much better advantage on a liquid at least partially clarified.

All tank methods, whether septic, Emscher or plain precipitation, give only a partially purified effluent and seldom one which is non-putrescent. But unless a large area for comparatively low-rate filtration is available anything better than a tank effluent can be secured only by processes which require tank treatment as a preliminary. The primary function of the tank is the removal of suspended matter by sedimentation. Any other service performed by it is along the line of assisting in the problem of disposing of the matter which settles out—the sludge—either by changing it into a liquid form or by getting it into a more compact and less offensive form, so that it can be more readily disposed of. The best that the septic tank can be expected to do is to liquefy two-thirds of the suspended matter, leaving one-third to be disposed of otherwise. The chief advantage of the Emscher tank appears to be that the sludge (which may be slightly less than that produced by the septic tank) is in a form more readily handled and less offensive.



EMSCHER TANK FOR POPULATION
OF 5,000.

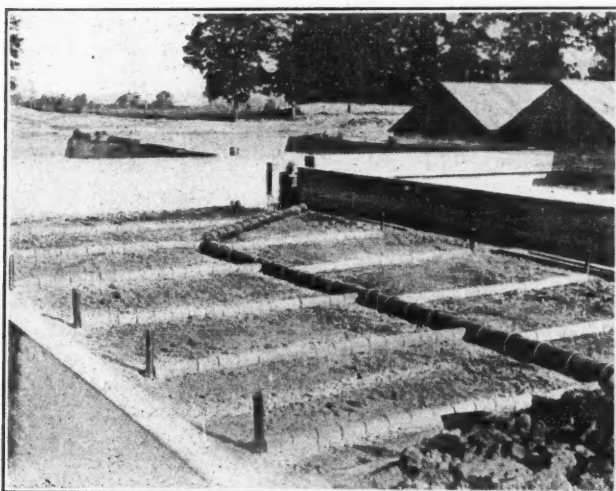
EMSCHER DOUBLE TANK FOR POPULATION OF 10,000.

GENERAL PLANS OF EMSCHER TANKS

We see, therefore, that all plants, except sand filtration, produce a resultant sludge which remains to be disposed of, and this is the most serious problem of sewage disposal yet remaining to be solved. In fact, even the sand filter produces almost as much residuum as the septic tank, but surrenders it in a dry and inoffensive form, so that it can be used for filling, with little danger of objectionable features.

Probably only two or three distinctly novel ideas have been advanced recently, and these are but variations on much older ones. The greatest prominence has been given to the Emscher tank of Mr. Imhoff, which has been used in Germany for two years or more. One or two experimental tanks of this kind have been under operation in this country, and the year 1911 will probably see two or more put into actual service. Another idea which is being tentatively adopted and experimented with is that of artificial aeration of filters or tanks by the introduction of air either by blowers or by outside air currents blowing into ventilating cowls.

More thoroughly established than these, although not quite so new, are sprinkling filters, several of which have been put into operation during the past few months in both large and small plants. One such installation is described in this issue. The difficulty due to freezing of the spray from the sprinklers (which, however, does not appear to have been a serious one at Columbus) has been avoided in two or three of the small plants by enclosing the sprinkler beds in superstructures. The principal feature of the sprinkling filter plants which requires further study and improvement is the matter of the sprinkler



MARION, O., CONTACT FILTERS
Showing underdrains in place. Population, 20,000

itself. No sprinkler head has yet been found which gives an entirely satisfactory, uniform distribution of sewage over the entire surface of the bed. Even theoretically this seems possible only by the use of movable sprinklers similar to those used in most of the English plants; but so far we believe no attempt has been made to use such movable sprinklers in this country. The objection to these usually offered is the danger of the probable interference of ice with the movement of the sprinkler arm or trough; but enclosing the sprinklers would seem to meet this objection.

This suggests ideas which have not been sufficiently considered in this country—the influence of climate upon the action and availability of the several sewage purification methods. There are a number of methods found or believed to be impracticable in the northern section of the country which it seems probable would give excellent results in more southerly climates, where the temperature seldom falls much below the freezing point. Outdoor sprinkling filters and the providing of abundant air of outdoor temperature in various ways are two features which find conditions more favorable for success in a southern than in a northern climate.

SEWAGE DISPOSAL PROBLEMS

Necessity for Reliable Automatic Hypochlorite Apparatus— Better Sprinkler Nozzles—Intensive Sand Filtration —Disposal of Sludge—Utilization

In December, 1910, a discussion was had before the Institute of Chemical Engineers in New York City on the general subject of sewage disposal, papers being read by Messrs. Rudolph Hering, George C. Whipple and C. E. A. Winslow. The last entitled his paper "Unsolved Problems of Sewage Disposal," and gave in connection therewith some information concerning recent experiments which is of more than usual interest. An abstract of his paper is given below.

The first unsolved problem which he mentioned is in connection with the use of bleaching powder for disinfecting sewage. In this, he says: "There is one difficulty which deserves the serious attention of the engineer. In a large plant it is comparatively simple to arrange automatic devices which will deliver a fairly constant supply of bleaching powder solution, and in such plants attendants are usually at hand to make up for any deficiencies which do arise. In a small plant, on the other hand, it is impossible to secure constant supervision. We must rely to some extent on automatic apparatus. It is exceedingly difficult, however, to apply a strong solution of bleach in small amounts without using devices which are liable to be frequently out of order. Small holes quickly clog, small weirs crust over, and it is a common experience to find such chlorine plants stopped up and entirely inoperative. Improvements along this line are greatly to be desired.

"The problem of distribution on the trickling filter is still, of course, a mooted one. The English moving distributors of various types give good results, but are costly and frequently out of order. Fixed sprinkler nozzles, if of small opening like that used at Birmingham, require much care (the constant attention of one man to an acre and a half of beds). Nozzles of large opening, like that devised at Columbus, give imperfect distribution and discharge such a large volume of liquid that they must be operated under a variable head. If the necessity for intermittency be granted (and the writer is not acquainted with any large-orifice nozzle which gives even distribution without it), it seems more logical to adopt a nozzle like the one worked out at Waterbury by Mr. Taylor, which is particularly designed to discharge in a thin restricted sheet which, under intermittent operation, moves back and forth over the wetted area. The gravity distributor, designed at the sewage experiment station of the Massachusetts Institute of Technology, in which the sewage drops down onto a concave disk from which it splashes upward and outward, seems to have justified itself as an alternative to the nozzle system which is worthy of consideration. Mr. Hammond at Mt. Vernon has made an important improvement in the splashing disk by turning it over at the edge; and the plant now in operation at Mt. Vernon shows that the gravity system may yield excellent results in practice and on a large scale.

"One other point which deserves attention in future studies of the oxidizing phase of sewage purification concerns the intensive possibilities of the intermittent sand filter. The original experiments at Lawrence pointed to a maximum rate of 100,000 gallons per acre per day, and in practice the Massachusetts plants have fallen below this figure except perhaps at Gardner and at Worcester. Many of them have operated at less than one-half this rate. With the Massachusetts practice of applying crude sewage to the beds, such low rates are necessary, for the winter clogging sets a sharp limit to their capacity. If, however, suspended solids were removed by proper preliminary treatment it seems probable that a much higher efficiency could be maintained. A dose of 100,000 gallons on an acre corresponds to a depth of less than 4 inches of sewage. With a clean bed of fairly coarse sand, well leveled and equip-

ped with good distributors, such a dose disappears in half an hour and may be repeated once in every six hours without the slightest interference with nitrification. In the Middle Western States (as at Wauwatosa, Wis., for example) plants designed on this principle, with a septic tank preceding the sand filter, are said to operate with success at a rate of 400,000 gallons per acre per day. Analytic data are, unfortunately, in most cases not available." Mr. Winslow then described an experimental outdoor sand filter studied at the sewage experimental station of the Massachusetts Institute of Technology. This was under the charge of Professor Phelps and himself. From August, 1909, to May, 1910, septic effluent was applied to a rectangular bed 21 x 22 feet, containing 3.5 feet in depth of beach sand having an effective size of 0.36 mm. The rate was between 220,000 and 340,000 gallons per acre per day, applied in doses six hours apart. The effluent averaged 3.1 parts per million of free ammonia, 5.9 parts of organic ammonia and 19.1 parts of nitrates, with a relative stability of over 96. During the ten months the sewage of the bed was raked six times, but no material was removed nor was there any apparent deterioration in the character of the surface. From these experiences he believed that the possibility of considerably multiplying the rated efficiency of sand filters was certainly worth further investigation.

The removal of suspended solids from sewage he believed to be the problem which still presents the most serious difficulties. For the destruction of pathogenic bacteria and the oxidation of putrescible organic matter there is a choice between alternative promising methods; but for the disposing of the solid constituents of sewage there is no method which has been developed to a point of real efficiency, in this country at least. In fact, at many plants in this country the whole problem is ignored as if it did not exist.

The difficulty is not so much in separating the solids from the liquid as in disposing of the resultant sludge. Even in sand filtration from five to ten tons of dried sludge per million gallons is strained out and must be disposed of. The watery sludge from sedimentation processes amounts to fifteen or twenty tons when chemicals are used and from ten to fifteen with plain sedimentation, with a minimum of five tons with the most successful septic tanks. Maritime cities can carry this sludge to sea; those on large rivers may perhaps discharge it into these during floods; but for the majority of inland cities disposing of it is a serious problem. Land disposal is available for small plants, for a time at least; large plants have adopted mechanical drying or pressing followed by land disposal or burning. But all these are expensive and objectionable in other ways.

Mr. Winslow considers the possibility of obtaining more perfect liquefaction as being the most apparent possible solution. He states that, of fourteen septic tanks of which careful records have been kept, both in this country and in England, "Five show a solution of deposited solids of 30 per cent or less, four are between 30 and 40 per cent, three between 40 and 50 per cent, and only two over 50 per cent." Theoretically the percentage should be much higher and experiments have indicated that the most important factor in checking the liquefaction was the accumulating of the waste products of the septic process itself; and experiments were conducted by Professors Winslow and Phelps with a view of determining some method for continuing the liquefying action much further; those during the past year or two having been with a tank of the Dortmund shape, or one having a conical bottom, with the inflow at the bottom and the outflow at the top; the sludge, which collects at the bottom, thus being constantly washed in a current of fresh sewage so that the products of decomposition may be removed. Sludge has been removed from this only once in fifteen months, and then only for the purpose of analysis. The effluent has not suffered in quality from passing through the sludge, and the tank removes 50 per cent of the total solids it received. This effluent was the one used in the intensive sand filter experiments just described. Analysis of the sludge and tank contents for eight months of operation (most of them during cold weather) showed that 72 per cent of the

total deposited solids and 80 per cent of the deposited organic solids had been liquefied.

In commenting on the Imhoff tank Mr. Winslow stated that exactly the opposite principle appears to be applied here, in that fresh sewage is cut off as much as possible from the sludge; in spite of which fact it is reported that liquefaction is carried out to a very satisfactory degree and the sludge is well digested. He suggests, however, that the frequent removal of sludge—twice a week or oftener in some cases—accomplishes the same results by removing the inhibiting septic products and also by the greater or less stirring up of the remaining sludge which takes place. At any rate, the quiescence found in the ordinary septic tank appears to be unfavorable for complete liquefying action.

Concerning utilization of sewage Mr. Winslow expressed some ideas different from those which have been commonly entertained. He said: "With the improvements which are being made in drying and separating machinery nothing can be called impossible. The disposal of factory wastes is already recognized as primarily a problem of utilization rather than of disposal. Even ordinary domestic sewage sludge contains, when dried, two or three per cent of nitrogen and five to ten per cent of fat, and on distillation yields ammonia, tar, oil and a more or less luminous gas. There is a field which I am inclined to believe may yet at some future time be occupied by the industrial chemist." Garbage contains about the same percentage of grease, but is twenty to thirty per cent solid matter, whereas sewage sludge contains only about one-fourth as much solid matter. The grease recovered from garbage makes the utilization of the latter more or less profitable. Whether or not equal profit could be derived from the treatment of sewage sludge, with its very much larger percentage of water, is one of the important problems to be solved by the chemist and other investigators along these lines.

CONCRETE PAVEMENT IN BOZEMAN

In our issue of March 10, 1909, there was described the method of constructing a concrete pavement in Bozeman, Mont., in 1908. Last year another section of concrete pavement was laid as a continuation of the 1908 construction. This new section was one block, or 540 feet long and contained 3,313 sq. yds. The work was constructed by S. Birch & Sons Construction Company of Salt Lake City, the prices being: excavation, 50 cts. per cubic yard; gravel fill, \$1.50 per cubic yard, and concrete pavement (not including excavation or fill), \$2.05 per square yard. The total cost was \$2.39 per square yard. Red Devil cement was used, manufactured by the Three Forks Portland Cement Company at Trident, Mont., and costing \$2.50 per barrel. Sand cost \$2.50 to \$2.75 per cubic yard, and gravel from \$1.25 to \$1.50. Labor was \$2.50 per day of eight hours.

After grading, the street was rolled with a ten-ton roller. Grade stakes were driven to the finished grade and from three to four inches of gravel was then placed on the rolled surface and tamped and gaged, allowing seven inches for the concrete. Templates of inch boards which exactly fitted the crown of the street were then placed every 50 feet at right angles to the curb; these being withdrawn after the placing of the concrete to provide expansion joints. Concrete was then laid to a depth of 5½ inches mixed 1 cement to 6 of natural gravel in which the stones were limited to 2½ inches diameter. Before the concrete had set, the grade stakes were withdrawn and a 1½-inch top finish was applied of 1 cement, 1 sand and 1 pea gravel, the latter limited to 1½ inches diameter. This wearing surface was not trowled or marked, but was given a rough float finish. The expansion joints were filled with an asphaltum compound and the pavement covered with sand and earth and traffic kept from it for three weeks. Both concrete and top coat were mixed very wet and placed with wheel-barrows.

According to city engineer Will S. Hartman, this pavement is not so noisy nor so slippery as the 1908 one, which was trowelled and marked off into blocks. Moreover the pavement laid this year was constructed in continuous strips across the street, while the other was not, and wear is occurring at the longitudinal joints.

PURIFICATION OF WATER SUPPLY

Methods Available—Slow and Rapid Sand Filters—Where Each is Most Effective—Cleaning Filter Sand—Double Filtration and "Prefilters"—Coagulation—Hypochlorite Sterilization—Ozone Treatment

THE past two or three years have seen considerable advance in the matter of water purification, both improvements in the methods previously in use and also the devising and practical adoption of new methods. The first methods to be employed in American cities were sedimentation and, more commonly, that ordinarily known as slow sand filtration; which were followed by mechanical or rapid sand filtration. These three were used for a number of years as practically the only methods of purifying municipal water supplies. Recently, however, coagulation (which is essential with rapid sand filtration) has been used to assist sedimentation. For certain classes of water intermittent or non-submerged filters have been recommended by European sanitarians but have not been adopted in this country. For sterilizing water, either filtered or unfiltered, hypochlorite of lime has come into very extensive use within the last year or two. Ozone treatment for the same purpose as well as for removing color and even a certain amount of suspended organic matter has been widely advertised, but there are no plants in this country, and probably only one or two in the world, which are successfully treating municipal supplies by this method.

A brief review of the present knowledge concerning these various processes is given below. In preparing this we have drawn largely on a report on "Purifying the Water Supply of Montreal," published a short time ago by Hering and Fuller, because in this has been collected together probably the best recent summary of the latest information on this subject.

Sand filtration has been practised for about eighty years in Europe and thirty-five years in some American cities. It was until very recently considered that the velocity of flow through these could not exceed two or at the most three million gallons per acre per day with satisfactory results. Recent experiments and improvements, however, have demonstrated the practicability of securing the best of results with a flow of two, and one half to five million gallons, and this has been carried up to even six or eight million gallons when the water has

been given preliminary treatment. Slow sand filters contain sand usually to a depth of 36 to 60 inches. Except in the smaller plants they are usually divided into beds of about one acre each.

While slow sand filters are not germproof, they are very nearly so under favorable conditions of construction and operation. They are especially adapted to the purification of waters which contain but little vegetable stain or color and which are comparatively free from mud. They will ordinarily remove from 20 to 30 per cent of the vegetable color or stain from a water. They will regularly remove turbidity to the extent of some 50 to 75 parts per million, and for short periods will remove quantities considerably in excess of this. They are not capable, however, of coping with the muddy waters of the Central West and Southern portions of the United States, unless the water is first subjected to expensive clarification methods. Such filters ordinarily show a removal of some 98 to 99 per cent of the bacteria contained in the unfiltered water.

Mechanical or rapid sand filters are frequently known as American filters, the type having been developed in the United States. These are especially applicable to the treatment of muddy waters and those deeply stained with vegetable matters. Its field of usefulness, however, extends to nearly all types of water, and it offers especial advantages where land is very expensive or that available is limited in area. These filters consist of sand layers 30 to 36 inches deep of a very uniform sized grain. They are arranged in comparatively small units, generally less than 1,000 square feet each, through which water is passed at a much more rapid rate than is the case with slow sand filters; the ordinary rate for mechanical filters being 125 million gallons per acre per day, which is equivalent to about 16 feet of vertical velocity per hour.

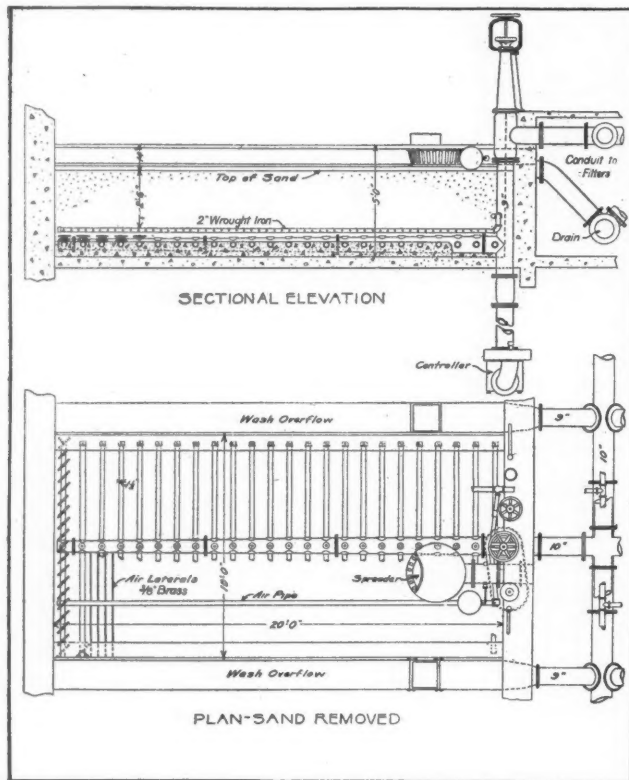
This type of filter depends very largely for its efficiency upon the gelatinous precipitate obtained from the decomposition in the water of a small quantity of sulphate of alumina or iron



GENERAL VIEW OF PROVIDENCE, R. I., WATER FILTRATION PLANT. POPULATION 220,000.

(about one grain per gallon). The resulting precipitate of alumina hydrate forms the necessary gelatinous films so as to permit the bacteria to be retained there until removed later by the process of sand cleaning or washing.

There are now in service in America for the treatment of municipal supplies approximately 350 mechanical or rapid sand filtration plants; this in addition to a number of other such plants, some of them of considerable size, for industrial establishments, clubs, etc. About fifty of these cities have a population of 50,000 or more. Some of the best known filters of this type are those at Little Falls, N. J., New Milford, N. J., Watertown, N. Y., Binghamton, N. Y., York, Pa., Harrisburg, Pa., South Pittsburg, Pa., Youngstown, Columbus, Cincinnati and Toledo, O., Louisville, Ky., Birmingham, Ala., and New Orleans, La.



GRAVITY MECHANICAL FILTER, MARIETTA, O.

One of eight units, each 20 x 10 feet and one-half million gallons daily capacity, or 109 million gallons per acre. Air wash

The use of slow sand filters has resulted in a very considerable decrease in typhoid death rates in most if not all cities where they have been installed; three such instances being those of Lawrence, Mass., where the typhoid death rate per 100,000 was reduced from 114 for the seven years before filtration was introduced to 25 for the fifteen years following; Albany, N. Y., where the death rate was reduced from an average of 90 for the ten years preceding filtration to an average of 22 for the nine years following its introduction; and Pittsburg, Pa., where an average rate of 133 for the eight years preceding filtration was reduced to 47 in the year following the introduction of filters for purifying a part of the supply only.

Well built and well operated rapid sand filters not only reduce turbidity and color but remove bacteria as well and thus greatly reduce the typhoid death rate, as is shown by the experience of several cities, among them being Binghamton, N. Y., where the death rate per 100,000 was reduced from an average of 47 for the five years before filtration to an average of 15 for the five years following its introduction; Cincinnati, O., where the death rate was reduced from an average of 50 for the four years before to 16 the year following; Columbus, O., where the rate was reduced from 78 for the eleven years before to 20 for the year following; Paterson, N. J., where the rate was reduced from an average of 32 for the five years before to an average of 10 for the seven years following; Watertown, N. Y., from an average of 100 for the five years previous to an average

of 38 for the five years following; York, Pa., a reduction from an average of 76 for the two years before to an average of 22 for the eight years following.

Possibly in no other branch of investigation has more money from city treasuries been expended than in that of filtration, and to this expenditure is largely due the advance which has been made in knowledge of the subject. During the past few years more than half a million dollars has been spent in water purification investigations which have been conducted by Louisville, Ky., Pittsburg, Pa., Cincinnati, O., Washington, D. C., New Orleans, La., Philadelphia, Pa., Harrisburg, Pa., Providence, R. I., West Superior, Wis., Richmond, Va., and New Orleans, La.

In several cities water has been subjected to double filtration, generally for the purpose of removing more or less turbidity from waters which seem to occupy an intermediate class between the clear waters which can be treated at high rates in slow sand filters and the muddy waters of the South and West which require constant coagulation. Among the earliest of these to attract attention were those at the lower Roxborough filtration plant of the city of Philadelphia, at Lancaster, Pa., and at Wilmington, Del. All of the purification plants in Philadelphia have been provided with preliminary filters substantially equivalent to rapid sand filters in which no coagulant is used; the effluent from these being further treated in slow sand filters operated at practically double the ordinary rate. Preliminary filters have recently been completed at Albany, N. Y., embodying the latest ideas in preliminary filtration. A careful estimate of the costs and relative rates of purification shows that, while equally good results might have been possible in most of these cases by single filtration, the higher rates thus made possible have effected an economy in the total process.

Coagulation, which is one of the essential features of rapid sand filters, has also been employed in several plants as an auxiliary of sedimentation. This is accomplished ordinarily by the use of sulphate of alumina and objection has been entertained in some cities against the "dosing of water with chemicals," although this material can hardly be considered any more of a "chemical" than the salt used in cooking. The use of this material for coagulation in an effort to clarify water dates back for several thousand years. It has been used for a number of years in the south and by the armies of European countries for clarifying muddy or polluted water when no better was available for drinking. Its use is generally recognized by experts in this country as being perfectly safe, and urgently necessary for many very muddy and highly colored waters. Its use preliminary to treatment in slow sand filters is carried on successfully in Springfield, Mass., Ferncliff and Poughkeepsie, N. Y., Washington, D. C., Indianapolis, Ind., and is included in the plans for the slow sand filter for the Croton supply of New York City. Coagulation alone, without the use of sand filters, is used at Omaha, Neb., Leavenworth, Kan., Kansas City, Mo., St. Louis, Mo., Nashville, Tenn. The basin in which sedimentation assisted by coagulation is to take place ordinarily holds a flow of 18 hours; although the capacity may vary with the nature of the material to be precipitated.

The hypochlorite of lime treatment and several plants in which it is used have been described in a number of issues of MUNICIPAL JOURNAL AND ENGINEER during 1910. Strictly speaking it is not a new process, but has been employed fifteen or eighteen years for eliminating the effect of sewage pollution from certain tributaries of the New York Croton supply. It was used at the time of a cholera epidemic at Hamburg in 1892 and as an emergency treatment in several places in Europe and Asia. It is only within the past two years, however, that substantial progress has been made in our understanding of the nature and accomplishments of this treatment for public water supplies, both alone and in connection with filtration. The material used is what is known commercially as chloride of lime or bleaching powder. Its action is largely if not wholly that of oxidation, its introduction into water being followed by several chemical changes, among which is the formation of hydrogen oxychloride, which is a most powerful oxidizing agent. As a

by-product calcium chloride and several more or less inert compounds are formed. The method is now used in more than 100 cities of the United States, this widespread use dating from the early autumn of 1908, when it was applied to the Boonton supply of the Jersey City, N. J., water supply and at the filtration plant of the Union Stock Yards at Chicago. Among the cities where it is now being used are Milwaukee, Minneapolis, Omaha, Council Bluffs, Indianapolis, Nashville, Cincinnati, Columbus, Pittsburg, Harrisburg, Philadelphia, and numerous other smaller cities.

It should be understood that this treatment is not a substitute for filtration in the removal of turbidity, color, tastes or odors, but only for destroying bacteria and a certain amount of suspended organic matter. Its special advantages are that it can be applied at little expense and on a few hours' notice as an emergency treatment when a water becomes suddenly polluted with disease germs; and also that it can be used as an additional precaution, permitting rapid filtration when a slower rate would be demanded for the purpose of bacterial reduction only.

There are a number of electrolytic processes which have been or are being used for the purification of water supplies. These in most cases rely largely if not wholly upon the electrolytic decomposition of salts in the water and the formation of hypochlorites. While there may be instances where electric current is so cheap and commercial hypochlorite so expensive that the electrolytic process is cheaper than the hypochlorite, in the majority of sections this is not the case. There are however, certain advantages in connection with electrolytic processes which would make them even more desirable than the use of bleaching powder if they can be made economically practicable.

OZONE TREATMENT

Much interest has been displayed, especially among the non-technical public at large, in the ozone treatment of water. As this is one of the most recent processes, and one concerning which it is difficult to obtain unprejudiced statements, we quote in full the Hering and Fuller report on this subject.

Ozone is a modified form of oxygen, and serves as a most powerful oxidizing agent for the destruction of organic matter, including living bacterial cells. It is found more or less in nature, particularly after thunderstorms, and is manufactured commercially through the use of electricity discharged through the atmosphere under very high voltage. It has been actively before the people as a prospective water purifying method for some fifteen years, and has attracted widespread attention.

We have followed its developments closely from the beginning, and have personally inspected its standing in Europe, particularly at Paris in 1900, 1905, 1906, 1908 and 1910.

Ten years ago this process was considered capable of sterilizing a water which was substantially free from readily oxidizable organic matter at a cost in the neighborhood of \$5 to \$6 per million Imperial gallons. There is no question as to the efficiency of ozone under suitable conditions in destroying bacterial life. There are some questions as to the degree of concentration of the ozone which must be present in the ozonized air which is to be mixed intimately with the water to be treated. The expense of the ozone treatment seems to increase materially with increases in the concentration of ozone in the ozonized air.

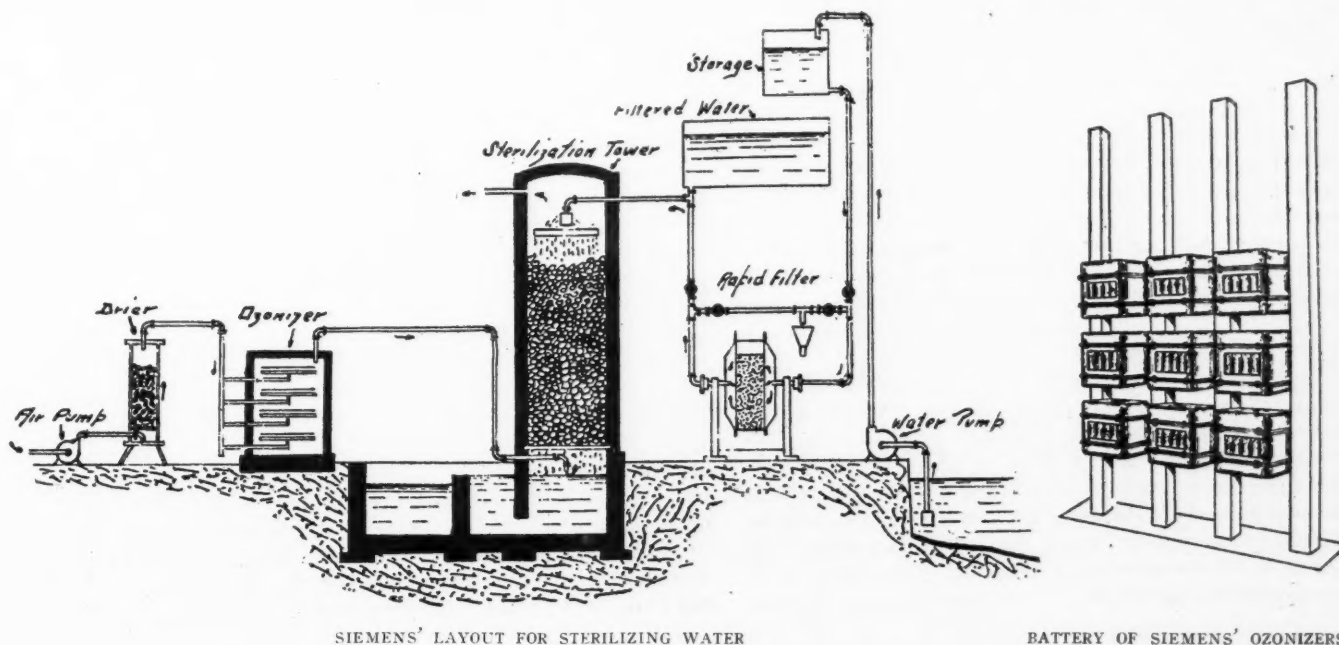
Marked progress has recently been made in perfecting ozonizers so as to render their performance cheaper and also much more reliable. Investigations as to the use of ozone were conducted at the Jerome Park Reservoir in New York City in 1907-08, but the result was unsatisfactory, partly owing to the irregularity with which the ozonizers performed, and partly on account of the prohibitive expense of the treatment.

In Europe there has been comparatively little development on a working basis in the past decade. Plants in regular service on a commercial scale are practically confined to the small town of Paderborn, in Westphalia. We have also seen a small plant in commercial operation at Breda, a small village in Holland. Another plant is at Wiesbaden, Germany, where it is held in reserve for the treatment, in case of emergency, of water from certain wells near the Rhine which contain contaminated water and which are not used regularly.

While numerous investigations at various places in Europe have been made with ozone, developments have been practically confined to the places above mentioned, and at St. Maur, one of the suburbs of Paris, where is located a sand filtration plant from which, after treatment with ozone, a portion of the city water supply is derived. The source of this water is the River Marne, a tributary of the Seine. For a dozen years or so St. Maur has been the scene of almost uninterrupted investigations as to the utilization of ozone for the treatment of the Paris water supply. Its use is proposed in connection with what are called preliminary filters, or roughing filters of the Puech-Chabal type. These preliminary filters are intended to act simply as clarifying devices, and it is the ozone which is relied upon to remove the bacteria.

A year or two ago it was decided to install at St. Maur an ozonization plant with a capacity of 20 million Imperial gallons daily. Plans for the installation of this plant, with a division of the contract equally between the De Frise and Otto systems, have been approved by the Minister of the Interior and by the Superior Council of Public Hygiene, but they have not been ratified by the Municipal Council. That is to say, no contract has been closed for these ozone devices. At present the works at St. Maur are temporarily out of service owing to damage caused by the recent severe flood, but are under process of repair. It is understood that still further tests are to be made, or are being made now, at St. Maur, on the Gerard system of ozonization, and that if this method or device proves satisfactory the 20-million-gallon contract will be divided equally among the three companies instead of the two above mentioned.

The construction cost of ozonization at Paris, according to the different systems, runs from \$6,000 to \$15,000 per million gallons daily capacity. The operating cost is estimated at



about \$6 to \$7 per million gallons, these figures being set forth in a report by Colmet-Daage, City Engineer of Paris.

There is no doubt about the Paris authorities being determined to get the best water obtainable from the local river water, as distinguished from further developments of distant gravity sources, and that there has been substantial progress made there as to the use of ozone as an adjunct to filtration.

Comparing the cost and reliability of ozone with the electrolytic decomposition of salt in order to obtain hypochlorite of soda, or upon comparing it with hypochlorite of lime, we see no justification whatever on the ground of cost, to say nothing of irregularity of performance, to recommend the ozone treatment at this stage of development. We formally reported to that effect to the Water Commissioners at Niagara Falls, N. Y., last February. Mention is made of this fact as illustrating our conviction in this regard for a project where electric power is available in large quantities at prices which can scarcely be lower elsewhere.

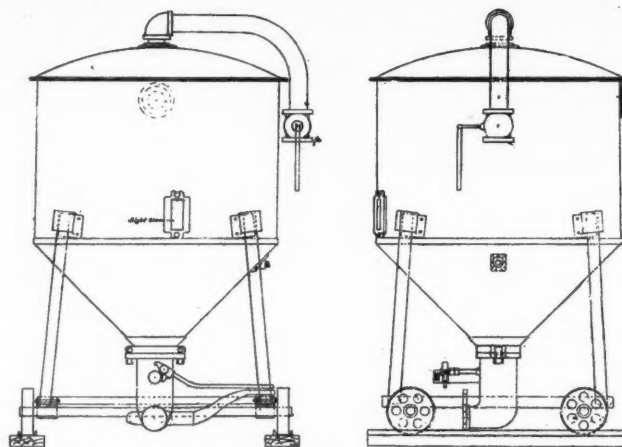
In our investigations of the Montreal project we have taken occasion to visit with Mr. Janin the ozone plants at Lindsay, Ont., and Ann Arbor, Mich. We consider them to be interesting plants, showing that ozonizers can be built and operated with fewer interruptions than we were led to believe possible from our observations of the developments three years ago at Jerome Park Reservoir, New York City. They are now being used at these towns above mentioned with filtration devices which are very crude and inexpensive. At Lindsay the Provincial Board of Health authorities of Ontario, under date of February 8, 1910, unqualifiedly condemned the ozone plant as a sterilizing process. They reported it to be unreliable, and attributed substantially all of the success of the plant to the arrangements and devices other than the ozone. At Ann Arbor it is claimed that the bacterial results obtained are on a more satisfactory basis than at Lindsay, but official reports have not been made public. At both of these places the ozone gives no indication of having any practical efficiency in the removal of color or vegetable stain from the water. At Ann Arbor the final treated water had a noticeable amount of vegetable stain, notwithstanding that use is made of a slight quantity of sulphate of alumina in the unfiltered water. Our experience with the use of oxidizing agents leads us to believe that ozone as a decolorizing agent offers practically no hope for successful results at a reasonable cost.

While we are keenly interested in the development of the ozone process we have no hesitancy in stating to you in unqualified terms that it has not reached a state of development where a city of the size of Montreal can afford to figure on its installation under present conditions.

NEW IDEAS IN FILTER CLEANING

One of the great novelties introduced during the past few years in connection with slow sand filtration is in the method of washing the sand. Originally the sand was scraped from slow sand filters by hand and removed by wheelbarrows to a point outside the filter, where it was washed and removed to the filter in the same way. In 1900 the city of Philadelphia began the design of the largest filtration works in the world and in doing so provided for the removal of the dirty sand by portable ejectors, employing water under pressure for transporting the sand to the sand washer. This method of ejecting sand has been copied by practically all the filter plants built since that time. Since 1909 the city of Washington has also been returning the washed sand to the filters by ejector hoppers similar to those used in removing it from the filters; a slow upward movement of filtered water through the sand in the bed being maintained while the washed sand is being placed by this process.

Since 1907 there has been used at the small filter plants in the Borough of Brooklyn the so-called "Brooklyn method." In this the water is allowed to fall in the filter until it stands



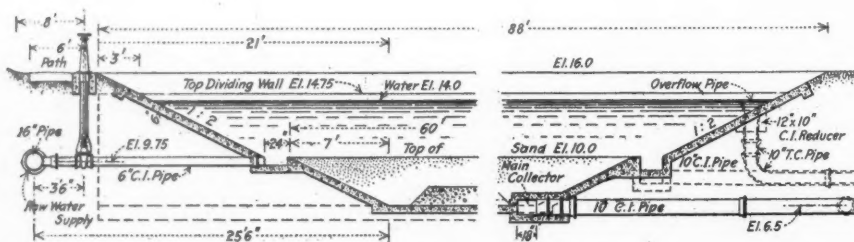
NICHOLS SEPARATOR FOR WASHING FILTER SAND

but a few inches above the sand surface, when outlets are opened which permit the water remaining above the surface to go to waste. The wash water is then applied at one end of the bed and is allowed to flow over the surface of the sand and escape into the drains, the direction of the flow being guided by boards set on edge, forming channels about 15 feet wide. As the water flows over the sand the surface is raked by men standing on the sand, this continuing until the wash water flows clear. Water is then applied through the usual inlets and filtration is resumed.

Since then two other methods have come into use for washing sand without removing it from the filter. The Nichols method, adopted at some of the Philadelphia filters in 1909, consists of ejecting dirty sand and water by an ordinary movable ejector hopper into a separator which is moved into the filter during the process of cleaning. This separator consists of a closed cylinder having a cone-shaped bottom in which are placed a valve and hose connections through which the sand is forced from the separator. The interior of the separator is arranged with a system of baffles and a disc, so that there is a down-flowing stream of sand and an up-flowing stream of wash water, and these are so proportioned that practically no sand is carried away in the wash water, which passes out at the top of the separator and is removed to a drain. The clean sand is discharged from the separator through a hose onto the surface of the filter from which the dirty sand has been removed. The separator is mounted on wheels and is moved from point to point in the filter as the cleaning progresses.

A third method of cleaning the sand without removing it is known as the Blaisdell method. It was first tried at Yuma, Ariz., then at the experimental filtration plant at Jerome Park reservoir, New York, and is now in use at the recently completed filtration works at Wilmington, Del. The plans for the filtration of New York's Croton water supply, which will be the largest plant in the world, are designed to provide for the use of the Blaisdell method. In this there is a washing machine consisting of an inverted box which is sunk under the water in the filter to the filtering surface and is held in position and operated from a movable platform supported from the walls or piers of the filter. This box contains a revolving hollow axle and head from which perforated teeth project into the filter any desired distance. The box can be raised or

lowered and the platform moved longitudinally or laterally, all motions being electrically operated and controlled by one man. The box is moved over the surface of the filter while at the same time the teeth are made to revolve slowly. Water under pressure is introduced through the axle, head and teeth, passing in fine streams into the box through the holes in the teeth. A centrifugal pump connected with the top of the box drains away a little more water than is supplied through the teeth and discharges it to a drain.



SAND FILTER IN BROOKLYN, N. Y., ARRANGED FOR CLEANING BY THE "BROOKLYN METHOD"

STREET CLEANING AND REFUSE DISPOSAL

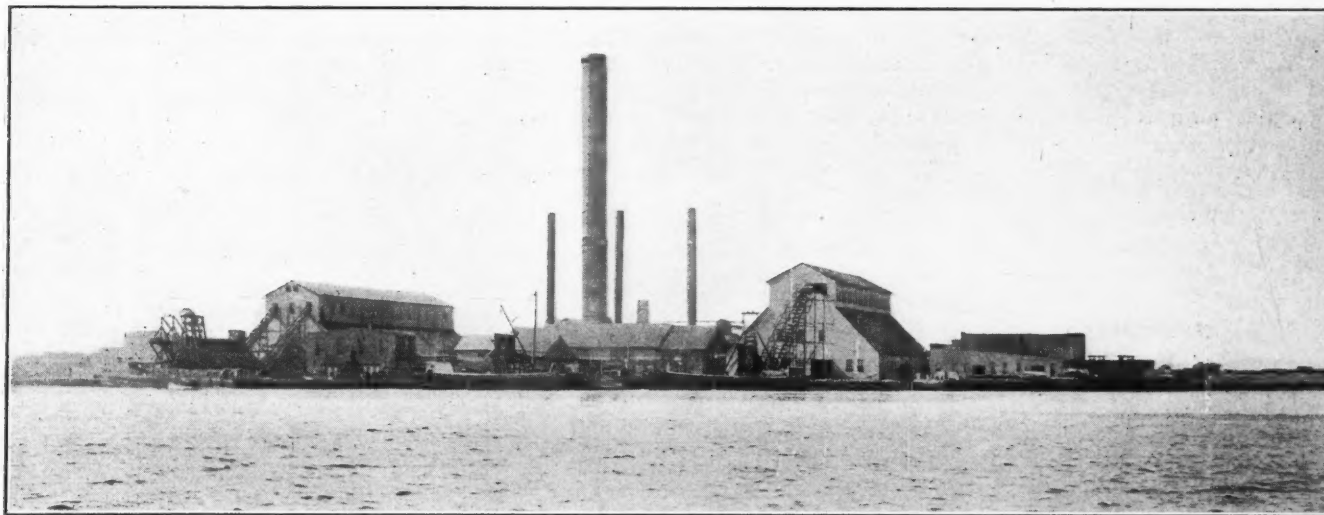
Flushing Methods of Cleaning—Collecting Ashes and Garbage—Refuse Destruction by High and Low Temperature Furnaces—Garbage Utilization—Disposal Methods for Small Cities

✓ In the matter of street cleaning the most important developments during the year have been the increasing number of cities which have adopted the use of water for removing street dirt to the gutters, this ordinarily being effected by the use of special flushing machines. The principal advantages claimed for this are three—that it removes the dirt from the pavement without creating dust; that it removes the fine dust much more completely than does any method of sweeping, and that it is cheaper. Certain city officials have objected to their use, however, claiming that deposits are formed in the sewers and that the flushing washes filler from between the paving blocks of whatever substance and hastens their destruction. It is to be hoped that within another year some actual data on these points may be obtainable; also on the matter of cost, only a few cities apparently having made accurate estimates of the relative costs of the different processes. New York City has made extensive tests of this, which appear to demonstrate the lower cost of the flushing method of cleaning.

✓ Every few months sees patents obtained for more or less complicated machines for both collecting and removing street dirt; the general principal in all being that of a revolving brush which sweeps the dirt onto a moving belt, moving buckets or some such contrivance, which raises it and deposits it into cans, which are removed from the wagon when full; or in some cases the dust is thrown by the broom to the bottom of

from each house the can as well as the garbage it contains has, we believe, been abandoned because of the great cost of the system due to the capacity and number of collecting wagons required, and the necessity of duplicate sets of cans. The city of Minneapolis requires all garbage to be drained and then wrapped in paper before being placed in the cans. This both prevents the garbage from decomposing rapidly and to a considerable extent keeps the can clean, thus minimizing the odors. We do not know that this idea has been adopted by any other cities.

✓ Considerable progress is being made, in the larger cities at least, in systematizing the removal of city refuse of all kinds and reducing to a minimum the amount of street haul required. This is effected by establishing a number of collecting stations throughout the city, each in the center of a fixed area to which all the refuse from that area is conveyed by horse-drawn or motor wagons. At these stations the material is discharged into cars drawn by either steam or electric motors, as branches of either a trolley road or a steam road, and in these cars is taken to some one point for treatment or to a distant section for use in filling land or otherwise being disposed of. With open garbage carts and uncovered dust carts this would make each collecting station a nuisance to the neighborhood; but, if properly covered carts are employed, this can be avoided, the station itself being a fully enclosed and ventilated building.

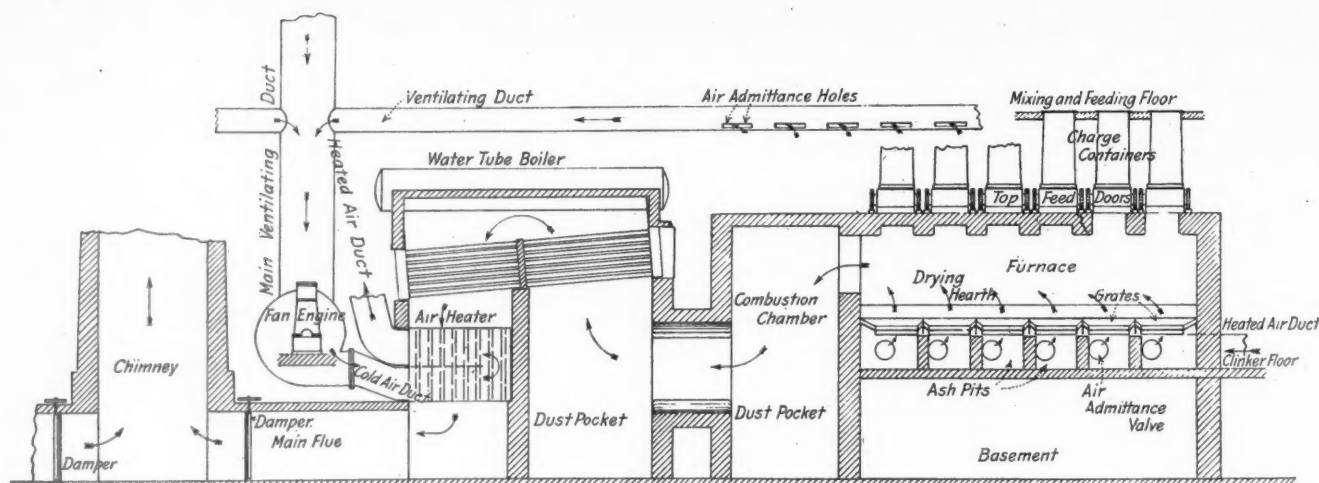


BARREN ISLAND REFUSE DISPOSAL PLANT, NEW YORK

a suction pipe, where it is drawn up by air suction and collects in tanks either by gravity or precipitated by fine spray. So far as we can learn, only one or two of these various machines have met with any success—in fact, most of them have never been actually tried. This journal is continually receiving inquiries concerning such machines, however, indicating that when one arrives which is really practicable and economical it will find considerable sale.

✓ In the matter of collection of ashes and garbage some progress is being made, but not nearly as much as is desirable; one of the greatest nuisances now encountered in city streets being the dust from the ash collecting wagon and the unpleasant odors from garbage wagons. In this line also some inventions are being made, however; two or three wagons having been described by us which are so designed as to make it almost impossible to uncover the garbage wagon at any time except when the buckets are being emptied therein; but these have not come into general use outside of the cities where they originated. The method tried in two or three cities of removing

✓ More change is perhaps being made in the practice of disposing of refuse than in the methods of collecting and transporting; the most important one being the increasing use of the English high temperature furnaces, or those in which the temperature is raised to at least 1,500 to 1,700 degrees, as compared with furnaces in which the temperature seldom reaches 1,000 degrees; it being claimed by the advocates of the former that such high temperature is necessary to prevent the clinker from containing organic matter not fully incinerated, and the discharge of gases from the stack not entirely deprived of their odors. Such plants have been established at the Borough of Richmond, N. Y., Seattle, Wash., Montreal and Vancouver, Can., Milwaukee, Wis., and Montgomery, Ala., and bids for the same for the city of San Francisco were received a few weeks ago. In each of these it is claimed as one of the advantages that a part of the heat created by the burning of the refuse can be utilized for power purposes; but so far the Montreal plant appears to be the only one on this side of the Atlantic where any real use has been made of this heat.



MILWAUKEE REFUSE INCINERATOR. LONGITUDINAL SECTION OF ONE UNIT

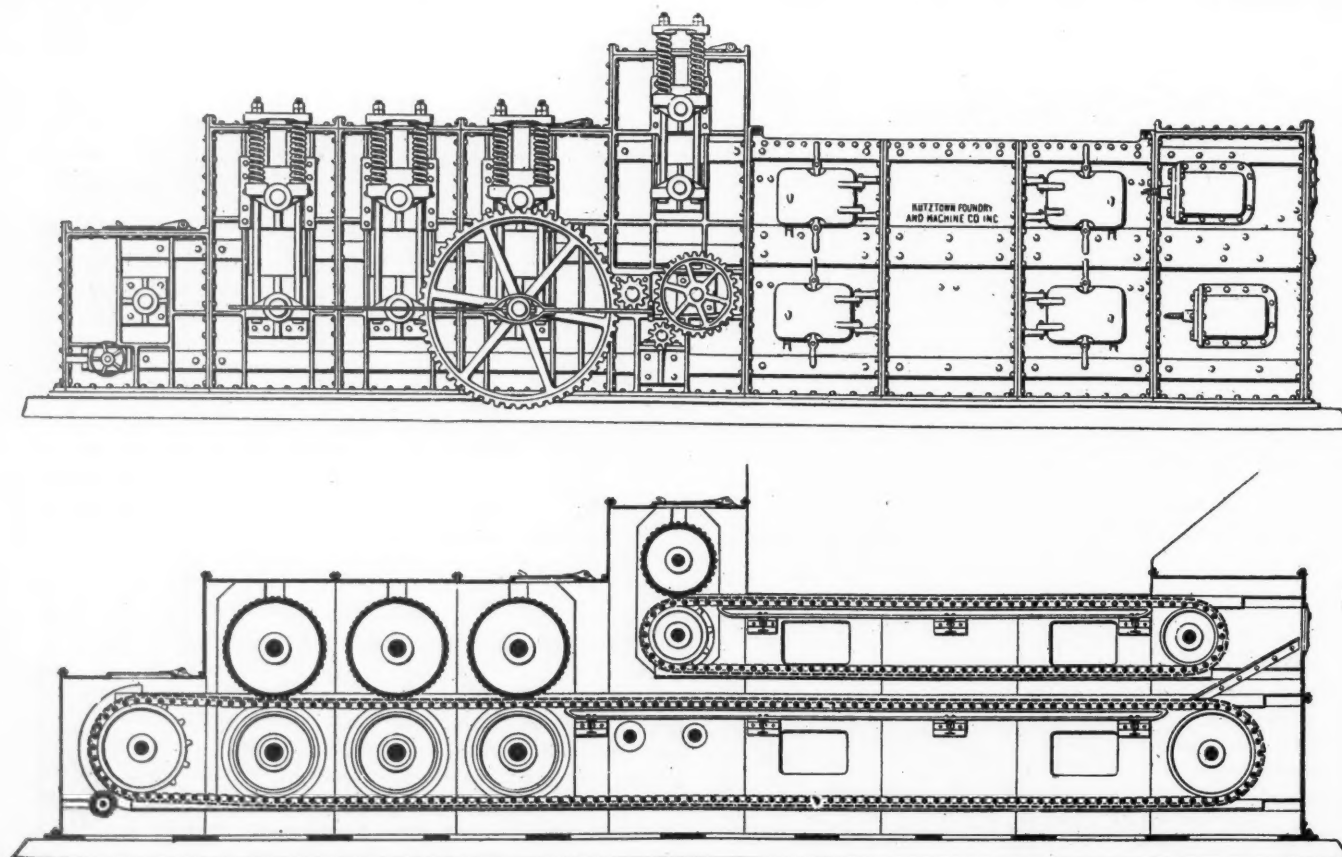
A method of disposing of garbage which seems to be practicable for large cities only is reduction by which the grease contained in the garbage is separated out and used for high-grade soaps, and the remaining portion is used by fertilizer manufacturers. The plants for this process are expensive, but when the amount of garbage to be treated is sufficiently great to keep a large plant in full service, there appears to be some actual profit in its operation. Most of these plants are in private hands, and receive a payment from the city for disposing of the garbage. However, two large cities now own utilization plants, Cleveland, O., having purchased one four or five years ago and later enlarged it, and Columbus having constructed one outright from plans prepared by experts.

In our issue of March 30th other methods of utilizing garbage were suggested, one of these, a plan employed in France, being that of composting and compressing garbage to be used by farmers as fertilizer, which might be adopted in the large cities of this country where market gardeners might find use for such fertilizer in intensive farming. Another idea is that

of using the combined ashes, garbage and rubbish for the manufacture of producer gas, which gas could then be used for operating electric lighting or power plants. So far as we know, this method has never been tried.

In general it may be said that the methods of incinerating garbage or utilizing it by extracting the grease can be employed only by large cities where the quantities of garbage are considerable; or else—an idea which we believe has not yet been put into practice—of collecting the garbage from a number of small towns into special railway cars, which could be filled at a collection station located in each town, these cars then being carried by rail to a centrally located utilization or incinerating plant operated either in common by the several municipalities, or by a company which should arrange with these municipalities for such service.

For the smaller cities, say those of less than 25,000 to 40,000 population, other methods must generally be found for disposing of the refuse; although it may be said that low temperature furnaces have been used by much smaller communities,



SIDE ELEVATION AND LONGITUDINAL SECTION OF CONTINUOUS ROLLER PRESS FOR GARBAGE

their use being common in the army posts of the United States, and when properly operated, these small furnaces have given very good satisfaction. For the small community, however, methods are available which are ordinarily cheaper than incineration or utilization, but which would not be practicable for the large city. The only ones which can be commended are burying in the soil and feeding to hogs. If fed to hogs, the garbage should be fresh when so fed, which means that it must be collected regularly at intervals of not more than two or three days in winter and daily in summer, and must be fed to the hogs without being stored on the farmer's premises long enough to even begin putrefaction. Some small communities in New England and also in Great Britain find this method satisfactory. When buried in the soil the garbage may be either spread broadcast and plowed under as a fertilizer, or it may be deposited in trenches to a depth of one or two feet and then covered with about 12 inches of soil, which may be that excavated from a parallel trench a few feet away. Garbage thus covered will slowly be reduced without offensive odors, the comparatively light covering of earth permitting the access of some oxygen. This reduction underground requires some time. If garbage is covered with a considerable depth of earth, ashes, etc., it may not reach a stable condition for many years and it would be unsafe to build residences upon land filled in in this way.

Experience of practically all cities seems to have demonstrated that it is very difficult to permit garbage to be collected by farmers and other private parties and so regulate

collectors that collections will be made regular and that no nuisance will be created in the city streets. It is therefore generally found that collection by the municipality is desirable, even where the garbage is privately disposed of or is taken by farmers; some cities collecting the garbage and delivering the same to farmers at stations along the outskirts of the city.

It is becoming quite generally recognized that practice along any lines which can be considered as progressive demands the study of the problem by those who have more knowledge of the subject than can be possessed by a city official, unless he himself has previously made a special study of the subject. It is consequently desirable that the question be submitted to engineers or other practical men who have had wide experience or made broad investigation of the subject. This should include not only the designing of plants, but also the location of them and the methods of collecting the refuse. These last are especially important since the cost of collecting refuse and transporting it to the furnace or incinerator is usually greater than the cost of disposing of it at these plants, and the difference between a proper and improper location of plant and method of disposal may mean a difference of thousands of dollars each year in the demands upon the city treasury. But most important of all, perhaps, in connection with incineration, is the skillful operation of the plant. The majority of plants fall far short of their intended efficiency and economy because they are put in charge of inexperienced, careless and ignorant men, who will work for low salaries, but do not earn even those.

STREET ILLUMINATION

Increasingly General Adoption of Electricity—Disadvantages of Gas—Efficiency of Electric Lamps Doubled in Last Five Years—Proportioning Illumination to Street Needs—Location of Lamps

PROGRESS during the past year or two has been made in the efficiency of street lights used, in the brilliancy of illumination and in the more effective general illumination of city streets. The greater part of the brilliant illumination has been confined to business streets and is largely due to private initiative, and in the majority of cases is supported by private funds.

Although in several respects gas lamps give a more pleasing light and are better adapted to units of low illuminating power than electricity, improvements during the past few years in styles of lamps and what may be called the mechanical side of electric lighting generally has so increased the efficiency and decreased the cost of this kind of lighting that in the majority of cities gas cannot compete with it on equal terms. In spite of the introduction of the gas arc and the incandescent mantle for street illumination, these have not been adopted as generally during the past year as was the case a few years ago. The mantle gives greater brilliancy at less cost than the open flame, but the cost of replacing mantles and the greater care necessary in lighting and attention to keeping the lamps in order largely offset this advantage. The facility with which wires can be strung at low cost for installing new electric lights where wanted, as compared to the cost of laying gas mains and the delay and tearing up of streets required, are additional arguments in favor of electric lighting. Partly on account of the same objections, various kinds of lamps burning gas generated at each lamp from gasoline or other liquid are employed more or less commonly for outlying sections of cities and small communities not provided with electric plants.

One illustration of the competition which electric lighting companies are furnishing, as compared with gas lighting, is the fact that they can now furnish tungsten street lamps of the same candle-power as gas mantle burners at the same or lower cost. The tungsten incandescent lamps are made of various sizes for street lighting, generally from 32 to 250 horizontal candle-power. They can be used on ordinary standard series street lighting currents, the same as are already

used for series arc and incandescent lamps; their introduction is therefore a simple matter in most cities and does not require a complete reconstruction of the plant.

For brilliant lighting, several improvements in the electric arc have been made and brought to a point of commercial practicability quite recently. The first change from the old open arc lamp was the enclosed arc, which came into general use about ten or twelve years ago. This has a small enclosing globe around the arc, which makes the carbons last longer, makes the light more steady, and, although the total amount of light is reduced by the double globe, it gives somewhat greater candle-power for the same amount of energy in directions a little below the horizontal, which directions are most effective for street lighting. The latest arcs, the flaming and magnetite, are referred to at length in another article in this issue. The electrodes are not composed of carbon, but, in the case of the magnetite, one is of copper and the other of various metallic salts, including magnetite. It seems unquestionable that the latter is a much more effective light, both as to actual brilliancy and in the number of candle-power, than the enclosed arc; but its general introduction is greatly retarded by the fact that its adoption in old plants requires a complete change in the whole installation. The most common practice with the older arcs is the use of a 6.6 or 7.5 ampere alternating circuit current, whereas the magnetite arc is generally used on a 4-ampere constant current direct-current circuit. The change to magnetite lamp therefore involves new transformers at the generator plant and expensive mercury vapor rectifying apparatus for changing alternating to direct current at the power station.

Another arc which is just beginning to bid for popular favor is the titanium carbide arc. This is more efficient than the magnetite, but the electrodes are more expensive, and, although it is adapted to operation on an alternating current circuit, existing alternating current standard transformers cannot be used, because these give a larger volume of current than is necessary for the titanium carbide arc.

It is safe to say in general that the efficiency of the illuminants now available is about double that of those used five years ago, with the same cost per lamp—that is, the same appropriation per mile can now secure double the illumination.

There are two general elements of street lighting, aside from the lamps to be used, which should receive more attention—in fact, which have not been sufficiently studied to make available the data needed for correct solution. One of these is the proportioning of illumination to the requirements of each street; the other is the location of the individual lamps. In designing a sewerage or water supply system, engineers carefully consider the population to be supplied or other factors going to determine the local demands upon the system, and regulate the sizes of mains accordingly. Something the same study should be made in designing a lighting system. To draw a partial parallel between this and a water distribution system, the use of light as an aid to policing the streets may be compared to the fire protection afforded by the water system; and the difficulty or importance of policing a given street should be recognized as an important factor in deciding upon the amount of illumination to be furnished. Streets frequented by a more or less unruly class or those where the temptations to robbery are greatest should be brightly lighted, even though the residents upon them do not ask or even wish this. In general, however, it may be said that probably the chief factor in deciding the amount of light should be the number of people using the street in question at night, such number occupying a similar place in this calculation to the population drawing upon the street mains in the case of water distribution system. The use of brilliant lighting on business streets, more than that necessary to permit safe and convenient use of the sidewalks and roadways, is largely a demand of merchants for advertising purposes and usually is and probably should be paid for by them.

In estimating upon the number or intensity of lights required, the point considered should not be that at the lamp, where the light is brightest, but rather the points midway between lamps, where there is the least illumination. Moreover, the fact that the eye is so constituted that the point fairly well illuminated may appear dark when one is facing a bright light or has just passed one should be borne in mind; and this calls for as uniform illumination as possible. The exact amount of minimum illumination necessary for streets of various degrees of importance, as well as the relation between this and the intensity of the lights employed, are subjects which have never received the study which they deserve. It is to be hoped that some of our wealthier cities will appropriate funds and employ experts for making a systematic study of this point, as has been done in the case of sewage and water purification, for instance.

In the matter of location of lights, there are three general classes of localities, each with its own problem. In the open park or square the illumination is desired equally on all sides of one or more points which may be established for the location of lights. On the business or other streets devoid of trees the space which it is desired to illuminate is bounded by the houses on two sides, but is unlimited lengthwise of the street. In streets provided with shade trees the problem becomes much more difficult because of the interference of these with the diffusion of the light. In general, it may be said that the first is especially favorable for the use of high-power lights; that, in the second, lights of medium high intensity can be employed to advantage, but in the case of the third the interference of trees necessitates the multiplication of centers of illumination and consequently lower intensities.

One thing which is not sufficiently realized is the fact that the modern brilliant lights should be placed much higher above the sidewalk than they usually are, this both because the greater altitude permits a wider distribution of the light and consequently more illuminating efficiency, at the same time increasing the uniformity of illumination, and also because in this way is avoided much of the glare in the eyes of those on the street level, which glare is not only unpleasant, but tends to make less effective to the observer the illumination

of the street which is actually secured. Modern arc lights should be not less than approximately 25 feet above the surface; abroad 30 to 35 feet is common practice. Even the incandescent gas lamps are usually placed too low, the temptation to economize by substituting them for the old open flame lamps on the same posts being largely responsible for the almost universal failure to give them the desired elevation.

For outlying streets probably the best location for the brightest lights is at the intersection of the roadway centers, where the illumination can be carried in all four directions; the brighter the light, the greater its height. Where the blocks are so long or the lights of such low candle-power that intermediate lamps are needed, these should ordinarily be of less intensity and placed lower, the presence of shade trees frequently making it desirable to use lamps of quite low candle-power placed along the curb and below the over-hanging branches. Under such conditions it will frequently, however, furnish better illumination, we believe, and be even more economical to provide separate lamps for roadway and sidewalk, suspending, say, one 60 to 100 candle-power tungsten lamp at considerable height in the center of the roadway midway of the block, and placing along the inside of each sidewalk as many low candle-power lamps as may be necessary for lighting it. Forty candle-power tungstens may be used where it is not desired to do much more than provide markers for the pathway; but 60 or 80 candle-power tungstens would give much better illumination at little increased cost.

STREET LIGHTING DURING 1910

Lighting by Private Enterprise—Decorative Lighting—Arches, Lamp Clusters and Brilliant Arcs—Tungsten, Flaming Arc and Magnetite Lamps

By E. L. ELLIOT, Editor The Illuminating Engineer

THE movement for better public lighting which began some five or six years ago has steadily gained in impetus until it has become so widespread as to amount almost to a public fad.

Several factors have contributed to this general result. The marvelously impressive illuminations of the several world's fairs held in this country since 1893; the rapid growth and development of the electric sign; the large use made of illumination in decorations for carnivals and civic celebrations, and the commercial introduction of electric lamps of vastly greater candle-power and efficiency than the older forms have all contributed to the common result.

On the other hand, the time was ripe—even a little over-ripe perhaps—for a general reform in the matter of public lighting. America had undoubtedly fallen behind in this civic improvement as compared with European countries. Furthermore, exterior lighting had been neglected, as compared with interior lighting, in which America unquestionably leads the world.

Perhaps the most remarkable feature of the case is the extent to which the new public lighting has been installed and maintained, by private enterprise. It seems that the public became convinced of its value so suddenly and so completely that it was too impatient of results to await the delays requisite to that degree of public education necessary to bring about the reform through the regular channels of politics and civic government. By far the larger part of all the installations of the new type that have been put in for the past five years owe their existence to the initiative of private citizens and civic organizations.

It is worthy of note in this respect that during the past year there have been several definite attempts to turn over lighting installations that had been put in and maintained by private contributions to the charge of the cities in which they are located. This is the logical outcome of the general movement; sooner or later it is inevitable that the public lighting installations that are now being maintained by private enterprise will become a public charge, the same as other civic improvements.

The difference between this and ordinary civic reforms is simply that private enterprise was willing to educate the public by actual object-lessons instead of waiting to persuade by argument alone. Decorative, or, as it is frequently called, "White Way," lighting accomplishes two definite purposes—it furnishes a better illumination, which facilitates trade and traffic, and it acts as a general advertisement for a city. Both of these purposes pertain to the city as a whole, and the expense involved is therefore properly chargeable to the public account.

Minneapolis was one of the first large cities to put in an extensive decorative street lighting system as the result of private subscriptions. The installation has been increased from year to year, and it is generally conceded that it has enhanced real estate values in the sections lighted to such an extent as to make it profitable for the city to take over its maintenance on the basis of increased taxation alone, and an effort has been recently made to have the city take such action, the private citizens who contributed the installation being willing to donate it to the city.

Philadelphia is the most conspicuous example of a large city that has remodeled its lighting along modern lines within the past two years, almost entirely at public expense. New York City, which contains the original "Great White Way" and more miles of fine, modern street lighting systems than perhaps any other city in the world, is seldom given any special consideration, probably because it is a matter of course in the metropolis, and has not been used as a means of publicity, for the reason that New York does not need to use any special means of general advertising, the fact that it is the social and financial capital of America being sufficient. But this argument applies to no other American city, and it is quite as legitimate for the city or town to advertise itself as it is for the individual or corporation.

What may be called the new public lighting has thus far been accomplished by three different methods—viz., arches or festoons of incandescent lamps over the streets; decorative lamp posts supporting clusters of tungsten lamps; and the new high-power arc lamps on decorative lamp posts placed along the curbs.

One of the first, if not the first, decorative lighting system in the country was of the first-mentioned type—the arch, or festoon—and was put up in Columbus, Ohio, as the result of a temporary illumination for a public celebration. In the first years of the new street lighting movement a number of installations of this kind were put in, but the method has very generally been discarded. It possesses several serious objections—the arches, or festoons, during the daytime cannot possibly be made decorative, and are usually positively ugly. In the evening the rows of light-sources give the street the appearance of being roofed over, thus creating the effect of a long, low-roofed building. While this arrangement of lights is satisfactory for street fairs and carnivals, it lacks the dignified effect which should characterize permanent municipal improvements. Very few installations of this kind have been put in during the year, and it is probable that the method will be entirely dropped in the near future.

The use of lamp posts or standards of a more or less ornate design, according to the funds available, supporting a cluster (usually five) of tungsten lamps, has been most favored during the past year. The tungsten lamp has proven very satisfactory in its performance as a street lighting unit, and its use in the manner described meets the demand for decorative effect very fully. As commonly designed, the posts are provided with four projecting arms at the top, each supporting a lamp in a globe of diffusing glass, with a single lamp in the center. In the smaller towns the posts are so wired that the four lamps may be switched off at midnight, or any hour desired, and the single central lamp left burning for the remainder of the night. The effect of an installation of these posts placed fairly close together along the curbs is satisfactory both by day and by night. By daylight they suggest a long colonnade, which is more or less impressive, according to the character of the standards, and in any case is an embellishment to the street. At night the lamps add greatly to the effect of perspective,

producing a vista that would be lost with the old methods of illumination; the numerous light-sources, furthermore, add greatly to the general decorative effect, lending an air of dignified festivity to the scene. It is a significant fact that every installation of this kind that has been put in thus far has led to the extension of the system, which is the surest proof of its intrinsic merit.

In considering the third system it may be of interest to state that at about the same time the new tungsten incandescent lamp made its appearance two new forms of arc lamps were also put upon the market. The first one to appear was the so-called "flaming arc," which was introduced from Germany. In this lamp the carbon electrodes used are charged with certain chemicals, which are volatilized in the arc, producing a vapor filled with suspended particles, both of which become intensely luminous. With the carbons generally provided the color of the light is a deep, golden yellow. Lamps of this type not only produce five or six times as much light for a given amount of current as the old form of carbon arc, but give individually a proportionately greater volume of light. Owing to their distinct color and enormous light-power, these lamps are conspicuous objects wherever they are placed. Their one shortcoming is the fact that they require frequent trimming, a single set of carbons lasting from 15 to 17 hours, which means daily attention if they are to be run all night, or trimming every other day at the furthest. This has been one condition that has tended to retard their use for street illumination in this country, where labor is expensive. There has been a greater tendency shown to consider this lamp for the past year than any time previous, and there are now several quite extensive installations. Newark, N. J.; Atlanta, Ga., and some smaller Western cities have such installations, the first two dating back more than a year, however. Where brilliant illumination of the pavement and surrounding objects is desired rather than a multitude of light-sources, the flaming arc stands at the head of all electric lamps.

The distinctly yellow color of the light of the flaming arc as generally used has met with some objection as giving too great a contrast with the carbon arc and the tungsten lamp, both of which are often in close proximity in private installations; and also as being too near to the lurid and spectacular. The use of carbons giving a nearly pure white light, which harmonizes perfectly with the tungsten lamp, is consequently coming into favor. Trial installations of this kind have been put up in the two open squares at the termini of the White Way section of Broadway and are eminently satisfactory. Copley Square, Boston, is another example of flaming arc illumination which demonstrates the special adaptability of this type of lamp to the lighting of large open spaces. Efforts are being made to obviate the one fault of the short life of the carbons of the flaming arc, with much promise of success; and if this can be accomplished the flaming arc will rapidly forge ahead as a luminant for wide streets and open squares. Even with its present handicap, it can successfully compete with all other light-sources for this class of lighting.

The latest of the new electric lamps, the so-called "luminous arc," or magnetite lamp, has made rapid strides in public use during the past year. In this lamp the electrodes are of two different substances—the positive, which is the source of light, consisting of an iron tube filled with magnetite (black oxide of iron); the negative being a simple copper rod. In efficiency of light production the luminous arc stands about midway between the carbon arc and the flaming arc. It has the advantage, however, of being of the long-burning type, and this has done much to bring it into favor with the lighting companies. This is partly offset by the fact that it can be used only on direct-current circuits, which necessitates certain additional expenses in transmission. The luminous arc has one very serious fault, from the illuminating engineering, or, perhaps we would better say, the hygienic standpoint; it is the most intensely glaring of all commercial light-sources. The light is a cold, blue-white color and contains a large amount of violet and ultra-violet rays, which are the most trying of all radiations to the eyes. The ultra-violet—invisible—rays are largely filtered out by the

glass globe with which the lamps are provided; but it is a remarkable fact, in view of the known danger of glare of any kind, and especially from light of this quality, that in most installations of this type of lamp clear globes are used. As a result, what otherwise might be a brilliant but soft white illumination is only a blinding glare of intolerably dazzling lights. Without the use of a heavily frosted or fairly dense opal globe the luminous arc lamp is unfit for use as an illuminant. Toledo, St. Louis, Baltimore and Syracuse are among the cities having large installations of luminous arcs.

One of the curious aspects of the movement for better public lighting in this country is the complete monopoly of the field by the electric light; gas has been entirely sidetracked. This is the more curious from the fact that the most brilliant public lighting in the world is produced by gas—in Berlin, Germany; and gas fully holds its own for this purpose throughout Europe. Notwithstanding the revolutionary improvements in electric lamps, the modern gas lamp—which also represents some substantial if not so spectacular improvements—still has a decided lead over its electrical competitors in point of economy of cost, while in quality of illumination it has never had a superior. The explanation of this fact may probably be found

in certain commercial conditions which prevail in America and also to the lack of enterprise on the part of the gas companies, who have let the case go by default. While there are some signs that gas may make a showing in this field in the future, it is not likely to regain any large portion of the ground already surrendered. Those who are looking over the various available light-sources for decorative public lighting should not leave gas out of the list, however, for it is not out of the race by reason of its own limitations.

While we have spoken only of the progress of decorative, or spectacular, lighting, it must not be inferred that the less conspicuous but equally important field of general street lighting has been neglected during the year. It is inevitable that the public interest aroused by special installations should result in general improvements; and such has been the case. One notable innovation is the extension of street lighting to interurban country roads. A beginning has been made in this direction, and where the ending will be it were rash to prophesy.

In conclusion, it may be said that the movement for better public lighting has shown steady progress during the year just past, and that the year to come is sure to witness a continuation of this very desirable improvement.

PAVING STREETS AND ROADS

Materials in Common Use, and Where Each Is Most Effective—Improvements in Construction Details— Bituminous Binders for Broken Stone Roads—Experience Not yet Crystallized—Importance of Aggregate

CONSIDERABLE progress has been made during the past few months in certain details of several of the older pavements; also a better understanding of the conditions under which each of these is most applicable and serviceable. In general it may be said that for very heavy hauling there is no substitute for granite block pavements. For ordinary heavy hauling, sandstone block, the best construction of brick, wood block and concrete are particularly fitted. For medium heavy traffic, sheet asphalt and asphalt block, brick (which may be given a lighter construction than when used for the heaviest traffic), wood block, or bitulithic are generally selected; wood block where noiselessness is an important consideration. Granite, sandstone and concrete can be used satisfactorily on any ordinary city grades; brick also can be so used, especially if beveled edges or depressed joints be used on the steeper grades. Wood block and asphalt, since they both present a very smooth surface without joint depressions, are apt to give trouble on grades of over 3 to 5 per cent. Asphalt block is in some cases used as being less slippery than sheet asphalt; and bitulithic is generally even less slippery than asphalt block.

For light traffic city streets and suburban roads, brick and bitulithic are used where a fairly expensive construction is warranted by the amount of traffic; but in the majority of cases broken stone is used, generally combined with a bituminous binder in the form of so-called bituminous macadam or bituminous concrete in the more recent construction. For ordinary country roads bituminous macadam is now being commonly used, the bitumen being either mixed with the aggregate or applied upon the surface, or as the cheapest improvement, either bituminous or hygroscopic dust layers are applied to ordinary broken stone roads.

In the matter of details of construction, there are certain improvements in practice which have been adopted more or less generally during the past few months. In the case of granite block pavement, the best pavements are now being laid with blocks squared much more truly than heretofore and laid with comparatively close joints, the same being filled flush with the pavement with Portland cement grout. These pavements are much smoother and less noisy than the old rough granite block pavements, and probably will prove more durable also.

In the laying of other block pavements, whether of stone, brick, wood or asphalt, it is doubtful whether any conditions warrant the use of sand for filling the joints, but Portland cement or bituminous filler should be used in all cases. The only possible exceptions would be where the paving is confessedly laid as a temporary one with the idea of replacing it within a year or two.

It is the function of all these materials to take the wear and the blows and transmit the pressure of traffic to the foundation, but not themselves to carry the loads. Consequently, unless the soil is a solid, compact one which has never been disturbed or, if disturbed, has been thoroughly settled, a concrete foundation should be used; and this is also necessary where excavations for house connections or other trenches are to be dug and pavement replaced over them. In streets where there is little of such excavating, and where the soil is fairly firm, however, pavements of brick or stone blocks laid without a concrete foundation have given good satisfaction, especially if the soil be compacted by the addition of more or less gravel and a thorough rolling with a heavy steam roller; or, better still, if a foundation of macadam be laid.

Brick street construction has practically been reduced to standard uniform methods, but effort is being made to improve the methods of testing the brick themselves, and it is hoped that during the coming year a much more satisfactory rattler test will have been settled upon.

The construction of sheet asphalt pavements some years ago reached the point where a general standard was universally adopted. However, during the past few years artificial asphalts, or those obtained by distillation from asphaltic oils, have come into quite general use and modifications of the mixtures employed have necessarily been adapted to the different forms and grades of such artificial asphalts.

Wood block paving has been increasing in popularity during the past year more than ever before, and there are many more firms competing for the business. As has been the case from the first, southern yellow pine is the most popular wood (originally long leaf yellow pine was demanded, but there is little of this now available and, moreover, it is generally believed that the short leaf gives practically as good service). Certain other

woods have appeared as competitors with yellow pine, however, for paving blocks, the most promising of these in the north being tamarack. None of these, however, has stood the test of sufficient time to demonstrate its worth. In the matter of the preservative to be used for wood blocks there is a radical disagreement and animated dispute among experts and manufacturers, the principal points of difference being as to the desirability of permitting the use of any creosote except that derived from pure coal tar, and the specific gravity which should be demanded, whether this should be slightly below or slightly above 1.10. It is claimed by certain manufacturers (and denied by others) that the creosote preservative required by certain of the more recent specifications is a monopoly in this country and can be obtained from only one firm, if indeed it is obtainable at all.

While these details leading to more perfect use and adaptation of old paving materials are of great importance, the greatest amount of attention in the paving field has recently been devoted to the use of bituminous substances as binders and dust layers in connection with broken stone roads. The entire matter is still in the experimental stage, although this does not mean that there is any doubt as to the possibility of securing excellent results under proper manipulation. The questions which have not been satisfactorily settled are the proper principles of selection and manipulation of materials under varying conditions and requirements. In many cases bituminous treatment has given the best of satisfaction, in many others it has proved almost a total failure. It would seem that the determining factors must lie in the nature of the bitumen, the nature of the aggregate and the manner in which the two are combined. So far, each one of these has entered into the problem in different localities affected by so many varying conditions that no satisfactory solution has yet been reached. Little attention has been paid to the question of the aggregate, and it is possible that a more painstaking study of this may offer considerable help toward the solution. It cannot be said as yet, however, that there is any general unanimity of opinion as to the desirable characteristics of the bituminous binder to be used under any of the various conditions, nor as to the methods and proportions of applying this to or combining it with the aggregate. The United States Department of Agriculture, departments and bureaus of several of the States, together with many county and town highway departments, the engineers connected with companies making a business of road construction, chemical engineers and others are all working on the problem with more or less intelligence and with comparison of results among themselves, and it is hoped that the next year or two will see something like definite agreement on most points in place of the more or less chaotic conflict of opinions which appears to exist at present.

PRIVATE STREET LIGHTING UNSATISFACTORY

Girard, Kans., with a population of 2,800, for more than a year lighted its streets with 34 arc lights and numerous private lights on porches, in yards or over the sidewalks, the current for the latter being furnished by a municipal plant. There were still too many dark spots, however, and the cost of supplying current for the private lamps was disproportionately great, partly because these lamps were consuming current during several hours each day before dark and after dawn. The city is being conducted under the commission form of government, with a mayor and two commissioners, and owns and operates its own water and light plants. The commissioner of public utilities is now endeavoring to increase both the effectiveness and the economy of street illumination by discontinuing the private lights, and installing in place of them 100-watt tungsten street series lights, one at each street intersection. These lamps cost less than \$5 each and are operated on the arc light circuits. The cost in current consumption is approximately one fifth of that required for the arc lamps, while it gives a more satisfactory light. We are indebted to city clerk Fred A. Gerken for this information, which indicates commendably intelligent enterprise for so small a city.

OHIO EXPERIMENTAL ROAD TESTS

Results on Columbus Experimental Road—Seventeen Materials and Methods Tested—Condition After a Year—Additional Experiments

The Highway Department of Ohio, of which Mr. James C. Wonders is Commissioner, has recently issued a bulletin describing the appearance early in the fall of this year of the several sections of an experimental road which was constructed by the department on Nelson avenue, Columbus. This is one of a number of experimental roads which have been built in various sections of the country, and several of which have been described in this journal. If properly conducted there should be much valuable information obtainable from such experimental roads, and their construction in various sections of the country is by no means unnecessary duplication of efforts, since methods or materials probably will not all act in the same way in different sections of the country where climate, traffic and even the mineral substances available for road metal may all differ.

So far the public have been informed concerning the construction of several of these, but little information has yet been available concerning the results obtained. This report is an excellent one not only because of the definiteness with which the condition is described, but also because of the excellent illustrations accompanying the same, being reproductions of photographs taken of the road material itself and not, as is the case with most photographs of roadway improvements, a picture of the scenery and surroundings of the road with little to indicate the condition of the surface itself unless this may be unusually uneven. The report contains photographs of each of the seventeen kinds of treatment, of which we produce the nine of which the photographs were the clearest, together with the report in full, which is as follows:

THE experimental road on Nelson avenue was constructed during the summer of 1909, and was described in Bulletin No. 12 of the State Highway Department. The real value of this work will be found in the information that may be obtained as to the wearing qualities of the different methods of construction that entered into it. At the end of a year's service most of the sections are in good condition, and in order that we may clearly present this condition to the reader, photographs have been made of typical parts of the surface of each section. These photographs were made by placing the camera vertically over the surface and at a height of about three feet. It is believed that a better idea can be obtained from these pictures than it will be possible to present by written words. There was but little dust on any of the sections, but before making the photographs the surface was swept clean so as to clearly show the arrangement of the stones in the surface of the road and the manner in which the binder is holding them. A six-inch scale is shown on the plates.

A description of the present condition of these sections follows:

EXPERIMENT NO. 1—GLUTRIN

Except for a brownish discoloration, this work has the appearance of water-bound macadam. Undoubtedly the application of Glutrin hardened the surface at the time it was applied, but by the end of the winter this condition had disappeared. Good results could doubtless be obtained by the application of this material each year.

EXPERIMENT NO. 2—STANDARD ASPHALT BINDER

This section is in good condition. The asphalt has exuded to the extent that it covers about one-half of the surface and shows plainly the marks of the horses' shoes.

EXPERIMENT NO. 3—PIONEER ASPHALT

In this section all of the pieces of stone are perfectly bound. No excess of binder is in evidence, the surface is smooth, and its whole condition is excellent.



EXPERIMENT 1—GLUTRIN

EXPERIMENT 2—STANDARD MACADAM ASPHALT BINDER

EXPERIMENT 5—TARVIA B

EXPERIMENT NO. 4—TARVIA "X"

The stones are all well bound in this section, and no excess of tar appears on the surface.

EXPERIMENT NO. 5—TARVIA "B"

This was the only bituminous surface treatment applied, and the result far surpassed our expectations. A thin coat of tar remains over the surface of the road. Its appearance is fine and it has been more nearly dustless than any of the other tar or asphalt-treated sections.

EXPERIMENT NO. 6—LIQUID ASPHALT

On this section the stone forms the wearing surface, but it is all firmly bound in place. Its condition is very similar to that of Experiment No. 3.

lar to that of a sheet asphalt pavement on an extremely warm day. The part thus covered is dustless and provides an ideal road surface.

EXPERIMENT NO. 10—WADSWORTH MACADAM

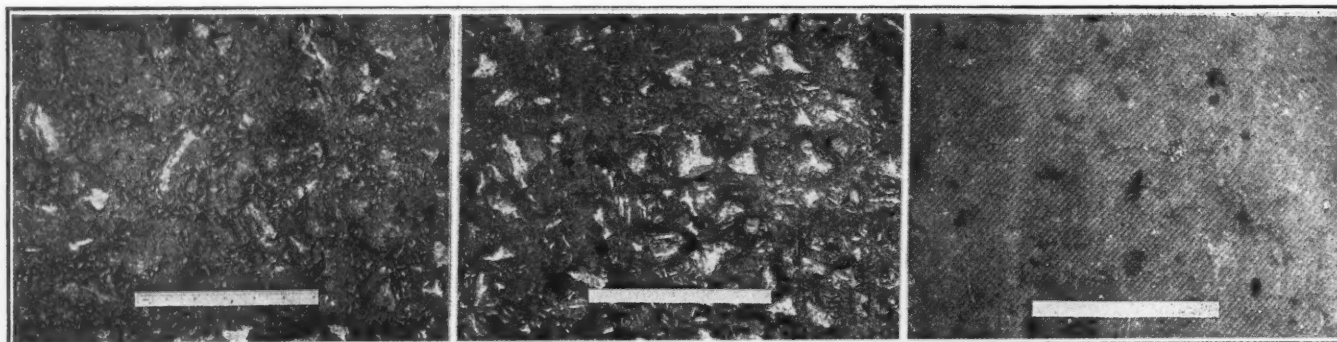
This section is surfaced with Kentucky Rock Asphalt, and at the present time is in as fine a condition as the best sheet asphalt pavement, and it is in better condition than when first constructed.

EXPERIMENT NO. 11—CARBO VIA

This section is in good condition, in appearance being very similar to Experiment No. 4.

EXPERIMENT NO. 12—CONCRETE MACADAM

This section has the appearance of a water-bound macadam,



EXPERIMENT 6—LIQUID ASPHALT

EXPERIMENT 9—ASPHALTOLENE

EXPERIMENT 10—WADSWORTH MACADAM

EXPERIMENT NO. 7—UGITE

In the construction of this section the binder was applied on part of the work in one coat and on the remainder in two coats, but at the present time no difference in its condition can be observed. The stone now furnishes the wearing surface; each piece is firmly bound and the condition of the section is very satisfactory.

EXPERIMENT NO. 8—FAIRFIELD ASPHALTIC CEMENT

This section is in perfect condition, with the surface very similar to that of Experiment No. 3.

EXPERIMENT NO. 9—ASPHALTOLENE

About one-half of the surface of this section is covered with the binder, and on the remaining part the stone furnishes the wearing surface. Where the binder covers the surface of the road, the imprints of the horses' shoes show in a manner simi-

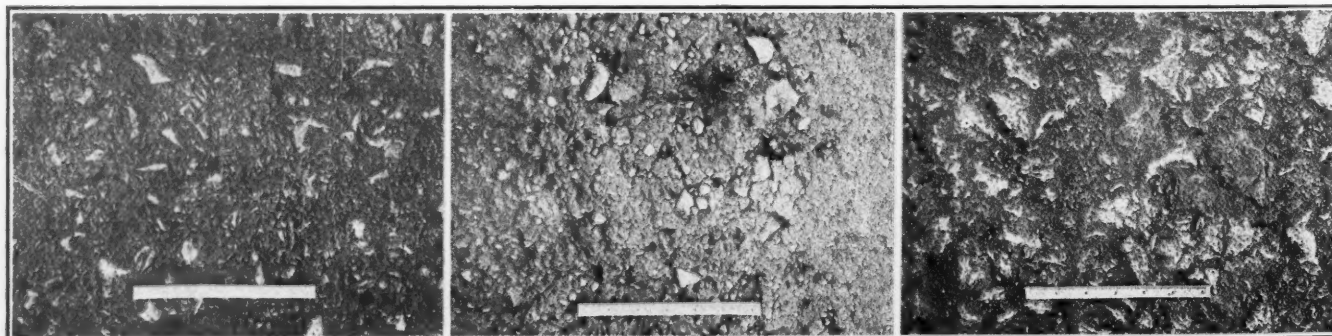
lar to that of a sheet asphalt pavement on an extremely warm day. The part thus covered is dustless and provides an ideal road surface.

EXPERIMENT NO. 13—TAROID

The traveled surface of this section is in excellent condition. There seems to have been an excess of tar used as it has been bleeding at the sides until the surface of the ground is covered to a width of about two feet.

EXPERIMENT NO. 14—PETROLITHIC PAVEMENT

With the beginning of the warm weather this summer, the asphalt exuded on the surface of this section to such an extent that vehicles avoided it, traveling in the ditches on both sides of the road. Its condition became so objectionable and so many complaints were received that we were obliged to have it repaired. It was accordingly covered to a depth of about two inches with screened gravel ranging in size from



EXPERIMENT 13—TAROID

EXPERIMENT 14—PETROLITHIC

EXPERIMENT 17—WATER-BOUND MACADAM

Note.—In each of the above cuts is shown a scale which was about 6½ inches long.

one-eighth of an inch to one inch, which was well rolled with a ten-ton macadam roller. The cost of this repair, exclusive of the rolling, was \$50.15.

At the present time the road is rutted by the vehicles that pass over it. Outside of the line of ruts the gravel still covers the surface.

EXPERIMENT NO. 15—LIMESTONE CONCRETE

A few places at the joining of different days' work in this section are beginning to show the effects of wear. About one-half of the section is in a very good condition, and it indicates that a satisfactory road could be produced by the methods used in its construction.

EXPERIMENT NO. 16—GRAVEL CONCRETE

This section is in good condition and shows but very little signs of wear. The surface is sufficiently rough to afford a good footing for horses.

The transverse cracks that developed last winter do not up to this time show any greater wear than the other parts of the road, the cracks showing only as lines across the surface. This section is dustless, and it is one of the most interesting of these experiments.

EXPERIMENT NO. 17—WATER-BOUND MACADAM

The automobile travel has removed all of the binder that was left on the surface of this section. The larger stones in the macadam provide the wearing surface. They are all perfectly bound and the condition of the road is satisfactory.

In order to provide a record of the wear on the different sections, levels were taken over the road soon after the completion of the work. The points at which the levels were taken were carefully located so that it is possible to ascertain the amount of wear by releveling at any time. Readings were taken on the center line, and at four feet and eight feet, both east and west of centers, at five stations on each section, making a total of twenty-five readings on each section of four hundred feet.

The work was relevelled in September of this year, and the result shows approximately a year's wear. The wear is shown in hundredths of a foot in the annexed table, and the amounts are the average at five points in each section.

Table Showing Wear on the Nelson Avenue Experimental Road One Year After Its Construction

Section.	8 ft. east.	4 ft. east.	Center line.	4 ft. west.	8 ft. west.
1. Glutrin	.07 ft.	.07 ft.	.00 ft.	.00 ft.	.00 ft.
2. Standard asphalt	.02 ft.	.07 ft.	.06 ft.	.08 ft.	.09 ft.
3. Pioneer asphalt	.07 ft.	.07 ft.	.05 ft.	.03 ft.	.03 ft.
4. Tarvia "X"	.02 ft.	.04 ft.	.04 ft.	.05 ft.	.03 ft.
5. Tarvia "B"	.08 ft.	.04 ft.	.03 ft.	.00 ft.	.00 ft.
6. Indian asphalt	.01 ft.	.03 ft.	.01 ft.	.03 ft.	.02 ft.
7. Ugit	.04 ft.	.05 ft.	.05 ft.	.03 ft.	.05 ft.
8. Fairfield asphalt	.04 ft.	.04 ft.	.04 ft.	.05 ft.	.00 ft.
9. Asphaltolene	.05 ft.	.04 ft.	.04 ft.	.05 ft.	.03 ft.
10. Rock asphalt	.00 ft.	.00 ft.	.02 ft.	.03 ft.	.04 ft.
11. Carbo-Via	.03 ft.	.09 ft.	.07 ft.	.08 ft.	.07 ft.
12. Concrete Ma-					
cadam	.04 ft.	.05 ft.	.05 ft.	.01 ft.	.00 ft.
13. Taroid	.02 ft.	.01 ft.	.03 ft.	.00 ft.	.00 ft.
14. Petrolithic	.03 ft.	.01 ft.	.06 ft.	.00 ft.	.00 ft.
15. Limestone Con-					
crete	.04 ft.	.06 ft.	.02 ft.	.00 ft.	.00 ft.
16. Gravel Concrete	.00 ft.	.00 ft.	.00 ft.	.00 ft.	.01 ft.
17. Water-bound Ma-					
cadam	.01 ft.	.03 ft.	.03 ft.	.01 ft.	.01 ft.

A census of the travel was also taken from July 31 to August 13, 1910, and the results are recorded in the table at the foot of this page.

DARKE COUNTY EXPERIMENTAL ROAD

The department has this year constructed another experimental road in which it has experimented with tar and asphalt in binding the gravel of Darke County, taking for this purpose a section of road opposite the fair grounds at Greenville. This work was begun on July 20 and continued up to August 13 of

the present year. Nine hundred gallons of tarvia X and the same amount of Indian Refining Company's asphalt were used in the work. The only roller available was one weighing fifteen tons, without water or coal, belonging to the city of Greenville. A ten-ton roller would, it was believed, have given better results, but none was available. The surface treated was uniformly 16 feet wide. There was a good bed of gravel on the old road and this was prepared for receiving the top course by spiking up the surface with the steam roller and harrowing and grading to bring it to the proper cross section, after which it was thoroughly rolled and watered.

Six hundred feet of road was treated in six sections, these varying in length from 72 to 130 feet. The tarvia was applied at a temperature of 340 deg. to 400 deg. Fahr. and the asphalt at from 400 deg. to 450 deg.

In the first section three inches of washed gravel was spread and rolled, and then about 1½ gallons per square yard of tarvia X was applied. This was then covered with about one inch of ½-inch to 1-inch gravel, which was allowed to stand over night and then rolled until buckling commenced. Three-fourths of a gallon of tarvia per square yard was then poured over the surface and a ½-inch layer of ⅛ to ½-inch gravel was applied, and after standing over night this was rolled for one and one-half hours. Whenever tarvia was found to be "bleeding" in spots sufficient gravel was applied to these to take up the tar.

In the second section the first two courses were prepared as in the first section, except that on top of the second course about one-half of the section was covered with one gallon per square yard of equal parts of tarvia and unrefined coal tar mixed, and the other half with three-quarters of a gallon per square yard of asphalt binder. The former was covered with ¾ inch of ⅛ to ½-inch gravel and the latter with ½ inch of boulder chips. This was rolled the next morning as in section one.

The third section had a bottom course similar to the first section, except that 1¾ gallons of tarvia X per square yard was used in place of 1½ gallons. This was covered with ¾ inch of ⅛ to ¾-inch gravel and rolled the next morning and then covered with ¾ gallon per square yard of tarvia X and this covered ¾ inch with ⅛ to ½-inch gravel, which was rolled for two hours.

The fourth section had a bottom course of 4½ inches of 1 to 2-inch gravel with 30 per cent of broken boulders. This was poured with 2½ gallons of asphalt binder covered with 1½ inches of ½ to 1½-inch gravel and rolled the next morning for half an hour. It was then poured with ¾ gallon of asphalt binder and the north one-half was covered with ⅛-inch to ½-inch gravel and the southern half with ¼ to 1-inch boulder chips. This was rolled the next morning for about one-half hour.

The fifth section had a bottom course of 1-inch to 2-inch crushed boulders spread four inches thick and partly filled with a clay filler, the filling being completed with limestone dust rolled in with the steam roller until all voids were completely filled. This bottom course was then thoroughly watered and rolled until a grout appeared on the surface. Next day it was again watered and rolled thoroughly, sand being added during the rolling.

The sixth section consisted of one course four inches deep composed of 1-inch to 2-inch watered gravel to which 30 per cent of crushed boulders had been added. The filling, watering and rolling were similar to that of the fifth section.

In the case of the first four sections the rolling was con-

Table Showing the Daily Travel on Nelson Avenue Experimental Road from July 31 to August 13, 1910, Between the Hours of 7 A. M. and 8 P. M.

Days	31	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
One-horse buggy	132	88	65	62	88	72	105	98	77	57	83	74	77	86	1,164
Two-horse carriage	2	3	2	1	3	1	1	2	0	0	3	0	1	1	20
One-horse wagon	16	46	58	46	43	39	83	11	45	57	63	48	50	74	679
Two-horse wagon	1	16	26	22	29	21	17	2	14	27	24	29	27	23	278
Runabout automobile	63	39	28	27	27	21	19	30	24	14	27	31	36	23	409
Touring car	70	55	59	45	66	45	53	83	61	14	44	65	70	40	770
Motor cycle	21	5	8	5	12	14	5	9	4	1	11	8	1	6	170
Horseback rider	6	1	1	4	2	0	2	0	3	2	6	0	9	3	39
Total	311	253	247	212	270	213	285	235	228	172	261	255	271	256	3,469

tinued in each case until buckling commenced. In addition to the rolling mentioned, the roller was run over the completed work each day until the last section was finished. One month after completion all of the road was in perfect condition except two or three small spots which had raveled in the part where unrefined tar had been mixed with the tarvia.

The total cost of the experimental road work was \$669.70. The gravel was furnished by the Greenville Gravel Company free of charge on board cars at their plant. The roller was hired from the city. The Indian Refining Company made no charge for the asphalt furnished by it.

CITY AS A BUSINESS PROPOSITION

Assessment of Percentage of "Unearned Increments" in Land Values Proposed—Dividends Instead of Taxes—American and European Examples

UNDER the title "Conservation in Municipalities," Hon Wm. Dudley Foulke, in a paper before the 1910 convention of the National Municipal League, presented arguments in favor of a city's profiting by the appreciation in value of the land within its boundaries due to its own growth. The justice of this and method of carrying out the idea he illustrated as follows:

If my own city of Richmond, Ind., were not built the land on which it rests might be worth, for farm purposes, \$100 or \$150 an acre. Practically the whole present value of the land is conferred by the city, and if the city merely charged rent or interest upon the value it conferred it could collect more than our entire taxes and could give a considerable dividend, not only to land holders, but to those citizens who owned no land at all. All a city needs to do, if it starts out right, is to assess a proper percentage upon the unearned increment of the land it occupies. Now, what is that unearned increment? If I own a cheap lot in a remote suburb and do nothing with it, but the city expands in that direction and people build all around me, this adds to its value many times. I have done nothing myself to make it worth any more, but the people who come and build around me have done it all. Yet I get the increased value which I have not earned, and the city whose growth gave the value gets nothing except a trifling tax from year to year. The city ought to have that increase and make me pay rent upon it, instead of taxing other things which I earn myself. In other words, if the city taxes what the city gives at its proper value there need be no taxes imposed on what it does not give—upon the product of industry, such as buildings, improvements and personal property.

I learned upon investigation that a city actually exists in this country where there are no taxes, and where all charges for necessary expenses are met in this manner. That is the city of Fairhope, on Mobile Bay.

A few emigrants from Iowa settled there on a sandy beach. As others joined them they formed a corporation and they adopted the initiative and the referendum. The land was owned by the city as a whole, and leased to the citizens. When one of these paid into the treasury the annual ground rent for his leasehold and the cost of installing a telephone there were no further taxes. After a decade and a half that city is said to be prospering under this system. There are free schools, a water system without rates, a public dock, a free library and a telephone service with no charges, all established out of the ground rent after paying state and county taxes and the cost of administration and improvements.

But our experience in this country is very meager compared with that of Europe. Orson, a town in Sweden, imposes no taxes. Moreover, the local railway is free to every citizen, and there is no charge for telephone service, schools, libraries and the like. This state of affairs is due to the wisdom of a former generation that planted trees on all available ground. During the last thirty years the town authorities have sold young trees and timber to pay the city's expenses, and judicious replantings have provided for a similar income in the future.

An article by R. Ockel, in the *Westminster Review*, states that in Germany no fewer than 1,500 towns and villages own so much common land that their inhabitants pay neither rates nor taxes, and 500 of these have so great a rental from their lands that they can pay each citizen on New Year's day a bonus of from \$25 to \$100. Much of this income is derived from communal forest land. In Forbach, for instance, the communal church was built with a forest nursery and is supported by a forest estate producing an income of \$15,000 to \$20,000 annually. In these European municipalities the trees are

not cut faster than they are replaced by the growth of new timber, yet even thus the forest of the Swiss city of Zurich yields an annual income of \$12 an acre.

In general, a city without taxation can exist only where the municipality owns a considerable portion of its land and takes advantage of increased values. The city must be "caught young" to make such a result possible. Our American cities have not been caught young enough for that, but is there therefore nothing we can do to approximate such a consummation? If we cannot eliminate taxes can we not lessen them by the profitable investment and management of what the city yet owns or can acquire? It owns its streets, and these, under proper management, ought to be constantly increasing sources of revenue. The right to use these streets for telegraphs, for telephones, for heating and lighting purposes, for water mains, for street car tracks, in short, for any profitable purpose, ought to be carefully guarded and the utmost possible secured by franchise from any person or corporation who uses them. In the past we have always been so eager to get the new system, gas, electricity, tramway or whatever it might be, that we have granted franchises with little regard to the future growth in the value of our streets. This must now cease. There is just as much unearned increment in a system of street car tracks, of water mains or gas pipes as there is in a city lot. Each year its value increases with the growth of the city, the increase of patrons and the establishment of new connections. The franchise which ties up for a long period this use of the streets for a fixed sum is pretty certain to be one from which the city in the lapse of years is bound to lose. The term of a franchise ought therefore not be too long, and the price demanded ought to be graduated so as to increase with the increasing value of the thing granted. The immediate result may seem unimportant, but it will not be long before the city begins to enjoy the providence which thus insures the participation of the public in the increased values that the city itself confers. If we cannot catch our cities very young let us catch them before they grow any older than they are. Many of the most important franchises are still to be granted and should be guarded in accordance with the best models, not only of our own country, but of cities abroad, where they do these things much better than we do them in America.

A side light on the effect of population in increasing land values, and on the value of a life to the city, is shown by some remarks recently made by Mr. Frederic C. Howe, member of the Cleveland, O., Board of Assessors. He stated:

We found that in ten years' time land values increased \$177,000,000, and that the population in the same time increased by 172,000. That is, that for every man, woman and child who came into the city during that period \$1,000 was added to the value of the land. That is a fact of substantial value to the single taxer. We confirmed the estimate which has been frequently made that land values not only respond to population, but respond in a definite and discoverable ratio.

CITIES HAVING COMMISSION GOVERNMENT

We are continually receiving letters asking for the names of cities which have adopted the commission form of government, and offer the following list on the authority of the Short Ballot Organization. If there are any omissions we would be glad to be informed of them.

Alabama: Birmingham. *California:* Berkeley, Modesto, Riverside. *Colorado:* Colorado Springs, Grand Junction. *Idaho:* Boise, Lewiston. *Iowa:* Burlington, Cedar Rapids, Des Moines, Fort Dodge, Keokuk, Marshalltown, Sioux City. *Kansas:* Abilene, Anthony, Coffeyville, Cherryvale, Caldwell, Emporia, Girard, Hutchinson, Independence, Iola, Kansas City, Leavenworth, Marion, Newton, Neodesha, Parsons, Pittsburg, Topeka, Wichita, Wellington. *Louisiana:* Shreveport. *Massachusetts:* Gloucester, Haverhill, Lynn, Taunton. *Michigan:* Port Huron. *Minnesota:* Mankato. *Mississippi:* Hattiesburg. *Missouri:* St. Joseph. *New Mexico:* Roswell. *North Carolina:* Charlotte. *North Dakota:* Bismarck, Mandan, Minot. *Oklahoma:* Ardmore, Bartlesville, Duncan, Enid, Miami, McAlester, Muskogee, Sapulpa, Tulsa, Wagoner. *South Carolina:* Columbia. *South Dakota:* Dell Rapids, Huron, Pierre, Rapid City, Sioux Falls, Vermilion, Yankton. *Tennessee:* Bristol, Clarksville, Etowah, Memphis, Richard City. *Texas:* Austin, Beaumont, Corpus Christi, Dallas, Denison, El Paso, Fort Worth, Galveston, Greenville, Houston, Kenedy, Lyford, Marshall, Marble Falls, Palestine, Port Lavaca, Sherman, San Antonio, Waco. *Washington:* Tacoma (modified). *West Virginia:* Bluefield, Huntington. *Wisconsin:* Eau Claire.

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239 West Thirty-ninth Street, New York
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A. PRESCOTT FOLWELL, Editor.
F. E. PUFFER, Assistant Editor

Business Department
S. W. HUME, President
J. T. MORRIS, Manager. A. PRESCOTT FOLWELL, Secretary

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Subscribers are requested to notify us of changes of address,
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Contributions suitable for this paper, either in the form of
special articles or of letters discussing municipal matters, are
invited and paid for.

Subscribers desiring information concerning municipal matters
are requested to call upon MUNICIPAL JOURNAL AND ENGINEER,
which has unusual facilities for furnishing the same, and
will do so gladly and without cost.

JANUARY 4, 1911

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General Review and Outlook

A LARGE part of this issue is devoted to a general statement of the present condition of knowledge and practice in connection with the more important municipal utilities and functions. This, it appeared to us, would be more useful—especially to the new officials, whom in particular we had in mind—than a mere review of what had been done along each line during the year. In each case an effort has been made to explain what the most recent experiences have demonstrated can be done, and how.

In every branch of municipal construction, invention and

enterprise are more active than ever before. City officials are continually having urged upon them new methods and devices, many of them untried, and are at a loss how to choose. The only safe way is to obtain the decision of an unprejudiced expert. But it is believed that the synopses here presented will indicate what practices are unquestionably safe and what dangerous to adopt.

Our Aims and Purposes

As this issue comes out at a time when a great many municipal officials are for the first time entering upon their new honors and duties, it seems timely for us to give for their information a statement regarding the purposes and aims of the MUNICIPAL JOURNAL AND ENGINEER.

We endeavor to keep this the standard periodical for officials of cities and water works and other corporations conducting public utilities; also for contractors engaged in constructing such work. We publish practical information of all kinds which will be useful to all of these in their official or business capacities, the news of municipal doings, and nothing else.

The subjects covered include water supply, sewerage, street and road paving, cleaning and lighting, refuse disposal, public health and sanitation, police and fire protection, and others. While occasionally an article is published dealing in a technical way with new ideas in engineering science as applied to municipal improvements, in the main the reading matter is expressed in plain terms which are easily understood by mayors, councilmen, chairmen of committees and all others who are interested in municipal improvements.

The contents consist each week of illustrated descriptive articles giving useful information concerning the subjects named above; of current news regarding the various municipal doings of cities throughout the country; recent legal decisions; news of bids to be received and of contracts awarded; brief descriptions of appliances used in municipal work and of patents recently granted for such; news of civic and technical societies, and discussions between readers upon subjects of general interest. Once a month a carefully prepared index is published, giving information concerning every article dealing with municipal topics which appeared during the previous month in all American periodicals of any importance and many foreign ones, for the purpose that our readers may be kept informed of all current municipal literature.

We realize that if the publication is to serve its readers in the best manner it is necessary that information be obtained from those who are actually doing things, and contributions are urgently solicited from such and gladly paid for. We desire this paper to be used as a medium of communication between all earnest men engaged in this field. It is not necessary that a contributor be a literary genius. *Facts* indicating how any problem connected with public necessities has been worked out are what are wanted. Just as you have profited by the experience of others, it is your duty to make public such information as you possess which will help your fellow workers to overcome similar difficulties.

Discussions of important subjects are requested, whatever the views expressed. While the editor has opinions of his own on most municipal subjects, and occasionally expresses them editorially, he does not allow them in any way to influence him in the acceptance for publication of discussions or opinions sent in by correspondents. In fact, we desire to receive and publish opinions differing from those expressed by ourselves in order that our readers may have both sides of all questions presented to them.

We endeavor to furnish in these columns such information as our readers want. But it is impossible for us to anticipate the wants of all, and to meet individual needs this office acts as a Bureau of Municipal Information. When, for instance, an important subject is under consideration in any city and special information is desired regarding it, an inquiry addressed to the editor will be cheerfully and promptly answered. All subscribers are invited to make free use of this Bureau.

SANITATION AT LEBANON

THE city of Lebanon, Pa., is located over a limestone foundation which, like the surface strata of most limestone, is filled with crevices of greater or less width and depth. This formation underlies a considerable part of northeastern Pennsylvania, and the practice throughout this section, as well as in Lebanon, has been to dispose of the waste water from houses by excavating cesspools down to the rock at points where such crevices existed. The waste water poured into the cesspool then passed down into the crevice and disappeared so far as this property owner was concerned.

Recently Lebanon has found, as have other cities which have followed the same practice, that the capacity of the rock for receiving the suspended matters in this waste water has its limits, and in a great many cases these crevices have refused to receive any more house wastes and it has been necessary to empty the cesspools by hand from above. In speaking of this, City Engineer T. R. Crowell says: "For the last thirty-eight years we have been pouring into the ground an average of something over one million gallons a day. Now crude sewage is coming to the surface." This condition of affairs is to be remedied and the city expects to award a contract next Spring for sewerage about one-fourth of the city.

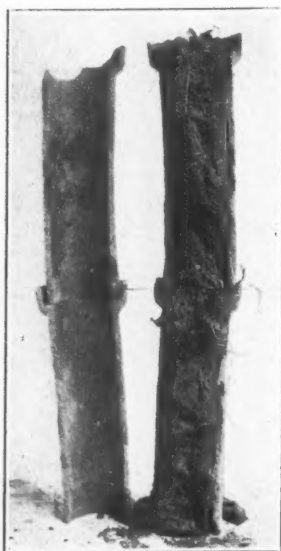
This method of disposing of sewage is not unique or peculiar to that section of Pennsylvania. There are at least two cities in the country—possibly more—which have constructed a system of sewers for removing the household wastes from practically the entire city which discharges them into a crevice in the limestone rock. In at least one of these the crevice is becoming choked and another sewer outlet must be found.

The limestone deposits also are utilized for the disposal of garbage in Lebanon, the garbage being as a rule collected by private arrangement with individual collectors who dispose of it sometimes in hollows formed by these limestone crevices, but perhaps more often in abandoned stone quarries. An effort is made to avoid a nuisance by covering these deposits with layers of earth.

The voters at the last election gave a handsome majority in favor of bonds for constructing the sewerage system above referred to, and this encourages the city authorities to hope that they will be supported in further efforts toward improving and modernizing the sanitation of the city.

POPLAR TREES TO GO

At a recent meeting of the Board of Street and Water Commissioners of the City of Newark, N. J., a motion was passed requesting the Shade Tree Commission to discontinue their own planting of poplar trees on the city streets and to prohibit the planting of them by private individuals.



TWO LENGTHS OF 6-INCH HOUSE CONNECTION, SPLIT LENGTHWISE TO SHOW COMPLETE STOPPAGE BY POPLAR ROOTS.

This action was taken on account of the large and increasing number of obstructions to the city sewers and particularly to the house connections by the roots of these trees penetrating the joints of the pipes. Out of 56 obstructions of all kinds in house connections reported in 1909 15 were caused by poplar roots. Up to the first of December, 1910, 23 out of a total of 64 obstructions since January 1 had been from the same cause, and in November, 1910, the roots were responsible for 5 out of 12 obstructions.

The accompanying photographs show two views of a root which had worked through the joints of a 6-inch house connection and through that into the 12-inch main sewer in the street. A 12-inch pipe with 6-inch branch is shown for comparison. The tree stood at a distance of 19 feet from the point at which the root was removed. We are indebted to Mr. E. S. Rankin, Superintendent of Sewers, for the photographs and information.



ELM ROOT FROM SEWER PIPE.

GAS AND ELECTRIC STREET LIGHTING

In six of the largest German cities—Berlin, Hamburg, Amsterdam, Dresden, Charlottenburg and Cologne—the amounts of gas and electricity used for street lighting in 1908 were 48,270,601 cubic meters of the former and 4,423,529 kw-hours of the latter. As a cubic meter of gas will furnish approximately the same illumination as a kilowatt-hour of electricity, it is seen that gas was used for about ten times as much illumination as electricity in all the cities combined, and the ratio varied from four in Charlottenburg to twenty-four in Hamburg.

NEWS OF THE MUNICIPALITIES

Current Subjects of General Interest, Under Consideration by City Councils and Department Heads—Streets, Water Works, Lighting and Sanitary Matters—Fire and Police Items—Government and Finance

ROADS AND PAVEMENTS

State Takes Over Frederick Turnpike

Annapolis, Md.—The State Roads Commission has paid \$100,000 over to the stockholders of the Baltimore & Frederick Turnpike Company and taken possession of the old highway from Baltimore to Boonsboro, Washington County, a distance of 63 miles. The collection of toll has ceased. Since the highway was begun early in the last century it has been a toll road, and before the day of steam it was one of the most traveled thoroughfares in all the United States.

Route Followed by Pioneers Superior for Modern Highway

Fort Dodge, Ia.—H. Huebinger, a civil engineer in a party of men who are making a map of the Hawkeye Highway from Dubuque to Sioux City, declared the highway presents 100 per cent better opportunities for good road making than does the river-to-river road from Rock Island to Council Bluffs. He commended the skill of the emigrants to the west in pioneer days in picking out a natural highway. Huebinger declared he has found but half the hills he found on the southern trans-State route and that the highway has much better drainage than the southern route. Enthusiasm along the route, he declared, is intense, already equaling that along the other river-to-river road. Residents along two roads from this city to Manson each signed long petitions to the township trustees. Huebinger and his party made a careful examination of both roads.

Nearly \$2,000,000 Expended on Streets

Oakland, Cal.—Street improvements, including permanent pavements, macadam streets, sewers, sidewalks and culverts, have cost the city of Oakland \$1,758,956.08 during the past year, according to Street Commissioner Walter C. Howe's annual report. The following figures show in detail the work accomplished and the cost:

	Miles	Cost
Permanent pavements, completed 1910.....	8.52	\$603,986.17
Permanent pavements, under contract.....	3.20	249,611.00
Macadam, plain	11.80	238,323.01
Macadam, oil	4.37	129,514.40
Macadam streets, outside tracts	10.70	201,867.59
Sewers, sanitary vitrified pipe.....	9.10	89,691.55
Sewers, storm, reinforced concrete and vitrified pipe (Bd of Wks. contracts).....	2.7	52,478.36
Sidewalks (city permits).....	21.2	73,921.00
Sidewalks, private tracts.....	20.4	56,777.00
Concrete culverts, etc.		5,368.00
	106.39	\$1,758,956.08

The increase in the amount of work over the year 1909 is given as \$229,517. In 1909 the cost of the work accomplished was \$1,529,439, and in 1910, \$1,758,956.08. The report shows the following amounts expended in street cleaning on macadam streets and material carted away: Number of blocks cleaned, 5,860; number of loads of material carried away, 32,880; amount expended, \$46,572; approximate cost per mile, \$140. Fifty-six thousand miles of street watering was done at a cost of \$530 per day, the cost for the year's work (200 days) being \$106,000, or \$190 per mile. The report shows a total mileage in improved and unimproved streets, including the annexed district, of 504.32.

Separation of Grades in Cleveland

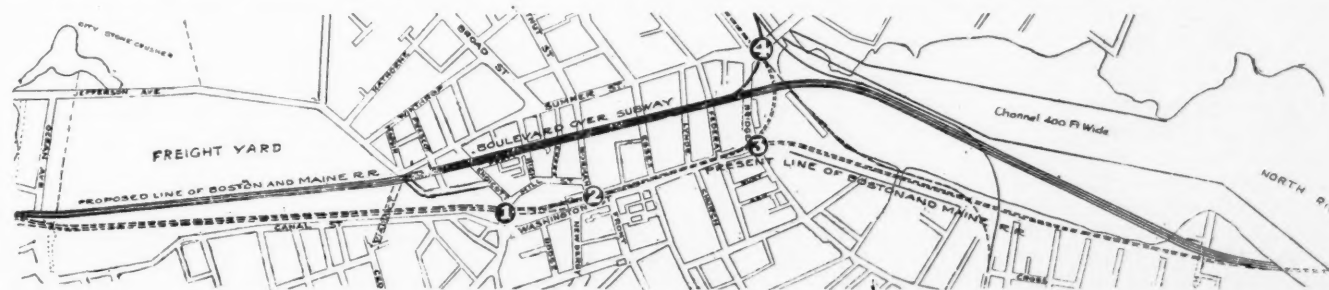
Cleveland, Ohio.—The estimated cost of the Pennsylvania grade crossing improvement is \$2,875,000. As the division of the expense is 65 per cent for the railroad to the city's 35 per cent, the city will have to assume \$912,000 of the expense. July 22 the electors of Cleveland at a special election authorized the expenditure of \$2,000,000 for grade crossing improvements. The resolution declaring it to be the city's intention to proceed with the improvement has already been made by Councilman Spooner. After it is adopted notices must be served on affected property owners and an ordinance authorizing the expenditure of the necessary funds must be passed. This must lie over for 60 days in order to give citizens an opportunity to circulate and file a referendum petition. The referendum must be awaited because of the fact that piers are called for in the streets at a number of the crossings.

Refuse to Pay for Patchwork Pavement

York, Pa.—More trouble is in store for York in connection with its "patchwork" asphalt paving on South George street, where some property owners refused to authorize the work and the contractors were instructed to pave before the residences of the others only. Property owners who had signed for the paving will now refuse to pay it, declaring that they had bargained for an improved highway and not for a checkerboard. Suit will probably be instituted.

Plan for Grade Crossing Elimination in Salem

Salem, Mass.—Engineer George W. Harriman, of the Boston & Maine Railroad, has made the plan reproduced below, which has been approved by Council, for the elimination of grade crossings in Salem. The distance covered by the proposed new route is about 10,000 feet, of which some 7,000 feet will be over land at present under the control of the railroad. The plan provides for four tracks to connect with the proposed four-track system from Boston to Beverly. The new line will diverge from the existing trunk line just south of the Broadway bridge, with no increase in curvature at Castle Hill, thence over the freight yards of the railroad on territory known as the Millpond reservation to the entrance of a subway beginning near the junction of Summer and Margin streets, and extending along a line under Crombie and Sewell streets, with the northern terminal on Bridge street to the trunk line opposite March street. The plan provides that this subway shall be 75 feet wide, 16½ feet in the clear from trackbed to arch of the subway cover, with an 80-foot boulevard above, extending from Federal street to the southern end of the tunnel. The boulevard, it is claimed, will prove of inestimable value in opening up a large area of waste land in the congested section of the city and make probable the erection of a large number of desirable buildings for trade purposes, as it is the avowed policy of the Board of Trade to enlarge the zone of the retail trade section and make this city one of the largest trade centers in the State. That no harm will come from plans to enlarge the trade center by removal of the station to another site is illustrated by cities like New Haven, Portland, Hartford and other places where removal of stations in no way disturbed long-established centers of trade.



PROPOSED RELOCATION OF RAILROAD IN SALEM, MASS., DOING AWAY WITH GRADE CROSSINGS

Boston Wants Teaming Tunnel

Boston, Mass.—Former Alderman Giblin, of East Boston, chairman of the executive committee of the East Boston Improvement Association, says a tunnel for teaming between the city proper and East Boston would solve the transportation problem of his district. He says the ferry system has been run at a loss of \$150,000 annually for 20 years, and that this \$150,000 loss would pay the interest on \$1,600,000, the cost of building the tunnel, and also the cost of operation. This tunnel would have a capacity of 4,000 teams per day, with escalators for pedestrians. He says that if a large fire started in East Boston the district would go before the apparatus could arrive from Boston proper over the ferries.

Query as to Application of State Law to Grade Crossings

New York, N. Y.—The city of New York will be out over \$1,000,000 if a motion heard before Supreme Court Judge Paige is sustained. The Central Trust Company, as trustee for Jason Rogers, asked that the city be compelled to pay interest on an award for change of grade made in 1903, which award has just been affirmed by the courts. The trust company moved under a section of the State highway law passed by the last Legislature providing that interest must be paid in such cases from the time the physical change of grade was made. Charles J. Nehrbaas, for the city, said the petitioners had the law passed themselves, but that they had their trouble for nothing because the State highway laws do not apply to the streets and avenues of New York, which are subject to special statutes. The interest in the present case amounts to only \$15,000, but on other awards it would amount to more than \$1,000,000, Mr. Nehrbaas said.

SEWERAGE AND SANITATION

Denies that Imhoff Tank Infringes on Cameron Patent

Atlanta, Ga.—City Attorney James L. Mayson has written the Cameron Septic Tank Company, Chicago, that acting on the advice of Dr. Rudolph Hering, the city's consulting engineer, and City Engineer R. M. Clayton, to the effect that the Imhoff system is not an infringement on the Cameron patents, there is nothing for the city to do but proceed with the construction of the sewage disposal plants along the lines recommended by Dr. Hering.

Wants Bureau of Sanitary Engineering in State Department

Austin, Tex.—In the annual report of Dr. Brumby, State Health Officer, attention is directed to the great need of active measures being taken to eliminate the now almost universal pollution of the soil through lack of sewerage and the prevalence of the open closet on the one hand and the contamination of our streams and waterways on the other as a plea to the establishment of a division of sanitary engineering in the Health Department, whose duty shall be the supervision of water and sewage nuisances and public building constructions.

Think New York Sewer Suit Is Near an End

Newark, N. J.—With the refusal of the United States Supreme Court to permit New York City to intervene in the suit brought by the State of New York against the State of New Jersey and the Passaic Valley Sewerage Commission, the latter body is inclined to think that in the near future the entire litigation will be ended.

Annual Inspection of Dairies

Syracuse, N. Y.—Inspector Lees is now engaged in making the annual inspection of the more than 500 herds supplying Syracuse with milk. On this inspection every producer is given a score based on the conditions disclosed. If the score is not up to the requirements the milk from the farm will be barred from the city's supply. "For three years," said Inspector Lees, "we have been giving instructions to the producers how they should keep their stables and cows and how they should cool, strain and otherwise handle the milk. Where the conditions were bad we have helped the farmers to remedy them and given the reasons. By this time they should know what is demanded, and if they do not care to come up to the requirements they have only themselves to blame."

WATER SUPPLY

Value of Plants Increases under Commission

Austin, Tex.—City Commissioner E. C. Bartholemew, in his monthly report on the earnings of the water and light plant, showed the property to be worth \$732,877, with outstanding indebtedness of \$145,730. The amount in cash reported on hand was \$68,683, this amount having accumulated since Austin took the commission form of government, in spite of two reductions in the water and light rates by the commission, as well as the payment of \$29,000 on the old dam debt. Austin has had the commission government less than two years, but its water and light plant makes a splendid showing under it.

Ultimatum Regarding Filtration Plant

Bellaire, O.—An order of the State Board of Health directing the city of Bellaire to place the filtration plant in operation has been received by Director of Public Service William Schramm. There is no other recourse for the city but to get busy and complete the plant at any cost. The matter has been in the hands of the State Board of Health for some time, and after investigating conditions in Bellaire, the Board decided the plant must be operated and laid the matter before Governor Harmon and Attorney General Denham, who approved the action of the board. The order is in the nature of an ultimatum and directs the city of Bellaire to have the plant in operation in six months after the order has been approved by the Governor and Attorney General. For failure to comply with the order, under the laws of Ohio, the city and city officials can be fined \$500, and the statute further provides for the removal of such city officials as fail to carry out the instructions of the State Board of Health. The filtration plant was completed about four years ago at a cost of \$80,000, and it is estimated that it will require a considerable additional amount to place it in operation.

Covered Reservoir Soon Ready to Use

Brookline, Mass.—Brookline's new \$100,000 covered reservoir, which is to become a valuable adjunct of the high pressure service, is completed and within a short time will be ready for a partial filling of water which will be allowed to stand until the reservoir is brought into regular service next spring. The reservoir is located on the summit of Single Tree Hill, in the upper section of the town, which is generally considered an ideal place for it. The reservoir is 23 feet deep and 180 feet in diameter, with a holding capacity of 4,000,000 gallons. It is constructed wholly of concrete and reinforced steel, and practically forms a watertight basin with a roof. The entire work has been completed well within the appropriation. The outside of the reservoir has been given a shapely appearance by the use of loam, which has been graded and seeded. Work was started on the reservoir in May, 1909. The first thing that had to be done was to construct a roadway from Boylston street to the reservoir location.

Competition for Municipal Water System in Colusa

Colusa, Cal.—The Colusa water works has announced that it will continue to furnish water to its old customers, as in the past, and advises consumers that it is not necessary to make a change. The new municipal system is now in operation and connections are being made.

Fitchburg's Water Failing

Fitchburg, Mass.—Meetinghouse pond, Westminster, from which the water for Fitchburg is being drawn, dropped eight inches during one week. Wachusett Lake, the usual source of supply, is not being drawn, but it has not filled up in a week and is not expected to. Fitchburg uses 4,000,000 gallons of water a day. The commissioners intend to serve notice on the consumers to use care. According to an estimate made by Superintendent Arthur W. F. Brown, of the water department, enough water remains in Meetinghouse pond to supply Fitchburg about a month. That does not include the water below the pipe line. At the end of a month, if conditions do not change, pumping apparatus will have to be put in, at a heavy expense, to force the water from below the pipe line in Meetinghouse pond and at the lake into the service pipes.

Broken Main 56 Years Old

Cincinnati, O.—The twenty-inch main which burst last week, tearing up Central avenue, between Fifth and Longworth streets, for a hundred feet or more, was laid in 1854, according to the records found recently by Waterworks Superintendent Laidlaw, who had specimens of the broken pipe brought to his office for examination. Very little damage resulted from the break because the overflow ran down a steep street into the river, not far away.

Water Famine Relieved by Private Works

Port Chester, N. Y.—Residents of Port Chester, Rye and Greenwich awoke Dec. 22 to find that their water supply had entirely failed. The towns have been supplied from the Rockwood Lake reservoir by the Greenwich Water Company. Edmund C. Converse, a New York banker, came to the rescue of the towns by turning over his private lake on the Converse Manor estate for the use of the villagers. The lake was connected by piping with the Greenwich Water Company's mains, and the water which is being pumped in the reservoir is being supplied to the public. The Converse lake contains 350,000,000 gallons and will give the towns a supply of water for three months. Mr. Converse declined to take pay for the water.

City Water Fever Cause

Rutland, Vt.—In a report made to the Board of Alderman the State Board of Health declares that, as result of a hearing in this city a few weeks ago, when testimony was taken from doctors and a number of officials, and from previous investigations, they are of the unanimous opinion that Rutland's recent typhoid fever epidemic, with its 80 cases and three deaths, was due primarily to the city water. It is pointed out that other factors such as milk and personal contact may have helped in the spread of the disease but that all the trouble for 10 years is primarily due to the water. The fact is cited that just prior to the last epidemic the examinations of Rutland water at the State Laboratory showed increased contamination. There is a good deal of feeling between certain doctors who lay the trouble to water and the city officials, who have made a big effort to prove their milk theory. The aldermen took no action on the report.

Special Tax on Lots Having Unused House Connections

Spokane, Wash.—As a result of a conference between Water Commissioner George W. Armstrong, Councilmen John Gray and A. J. Cartwright, an ordinance will be introduced in the City Council and urged for passage assessing a special water tax against every vacant lot in Spokane having city water available but not using it. The tax is expected to net the city \$100,000 per year. That the city Water Department is facing bankruptcy within 10 years owing to immense expenditures for extending the system, from which no return is had from vacant property which is benefited by enhanced value, but which is not using the water, was the statement made by Mr. Armstrong to the Councilmen.

Restricting Use of Water

Waterbury, Conn.—The serious view taken by the City Engineer and the Board of Public Works regarding the city water supply was shown last week when a vote was passed instructing the Superintendent of Water to prohibit the running of hydraulic elevators in all buildings about the city. Clerk Lawlor was instructed to notify the two local hospitals that their employees should use every reasonable effort to conserve the city water now used by the hospitals and prevent its waste. The clerk was also instructed to notify the Board of Education to co-operate with the Water Department in preventing any waste of the water supply in the school buildings.

An Unusual Water Supply

Woodward, Okla.—The city has a peculiar source of water supply, believed to be of great value. State Geologist C. N. Gould pronounces the supply good from every standpoint, and unrivaled in America. Woodward itself has an elevation of 2,000 feet, and the water range is more than 100 above the city. It is a barren, sandy country, having a number of springs, only a few of which are utilized. The level of the underground water rises to within a few feet of the ground over a wide area. It has been proposed to pipe water from this point even as far as Oklahoma City.

STREET LIGHTING AND POWER**Wants Sliding Scale of Charges for Gas and Electricity**

Baltimore, Md.—Mayor J. Barry Mahool has announced his intention of petitioning the Public Utilities Commission for the adoption of the sliding scale method of determining the general commercial rates in Baltimore for gas and electric service. Briefly stated, the plan provides for a certain percentage of earnings which the company is allowed to earn on its capital stock after deducting as much as possible of the watered portion of the company's capitalization. With such a percentage of earnings the plan provides that the company shall be allowed to charge a certain rate for gas or electricity which will, under economic administration, produce these earnings. With such an arrangement as a starting point the plan provides that for every reduction of a certain amount in the gas or electric rate the company shall be allowed to increase its distribution to stockholders 1 per cent. In other words, once established, the plan works automatically.

Electric Lights in Prospect Park

Brooklyn, N. Y.—Last week for the first time in its history Prospect Park had a modern, artistic system of illumination. Up till now the illumination of the park at night has been supplied by 150 gasoline lamps, mounted on posts of no particular artistic value. C. F. Lacombe, chief engineer of lighting and power, was possibly the chief instrumentality in bringing about the change, replacing the gasoline lamps with 750 ornamental iron posts, surmounted by symmetrical lanterns, in each one of which is inclosed an 85-watt tungsten electric incandescent lamp. The design of the posts is the work of the Municipal Art Commission, and is practically the same in appearance as the one used in Central Park, although there are some improvements in the mechanical construction which make it easier and simpler to clean the lanterns and substitute new lamps for old. Along all the drives these posts are placed 100 feet apart on alternate sides of the road. On the walks they are installed according to the best judgment of the engineers. One advantage these electric lamps possess over the old gas lamps is that it is so much easier and more economical to light them. Whereas it was necessary to light each gas jet separately by hand, the electric lamps are controlled in groups of from 20 to 50, according to location and distance apart. Thus as many as 50 lamps are lighted instantaneously from one point.

Street Gas Lamps Operated at Loss

Cincinnati, O.—President N. G. Kenan, of the Union Gas and Electric Company, has sent a letter to Service Director Sundmaker, in which he states that his company has hitherto operated the street gas lamps at a loss and that any contract made for the future must be at a much higher price. The maintenance charge hitherto has been \$5, and this includes lighting and extinguishing gas lamps, cleaning globes and repairs to service pipes.

Fails to Sell Bonds for Lighting Plant

Marion, Ind.—Not a single bid was offered for the \$50,000 issue of 4 per cent bonds offered by the city of Marion for the construction of a municipal light plant, at the meeting of the City Council, at the time set for opening bids for the bonds. It is said the reason no bids were offered was because the City Council had failed to rescind a former order of bond issue, on which the Fletcher National Bank, of Indianapolis, had bid \$325 premium on a \$75,000 issue of 4 per cent bonds to be issued for the same purpose as those offered recently. The Fletcher National Bank later recalled its bid, for the reason that information had reached the buyers that the taxpayers of Marion proposed to contest the bond issue. Edward Herbel, Councilman at Large, charged that "somebody had been putting a rail in the wheel to stop the progress of the municipal light bond issue." Though Marion owns a municipal plant for street lighting, the question of the city's maintaining a plant for commercial lighting carried at the ratio of five to one in a city election four years ago. The Marion Light and Heating Company, a plant of the American Gas and Electric Company of New Jersey, supplies Marion with commercial lighting at 10 cents a kilowatt hour.

Gas Supply Flows Into Open Air

Bridgeton, N. J.—A stoppage in some of the outlets of the Bridgeton Gaslight Company's plant was discovered December 27, and there was imminent danger of a terrific explosion that would wreck the plant and damage a good part of the city. The employees were kept constantly busy all day watching the gas, allowing thousands and thousands of feet to escape into the open air. The tanks were thus nearly emptied, and people dependent upon gas for illumination were obliged to dig up oil lamps and candles. Many people had no lamps, and there was a rush to the stores for them, practically everything in the line being sold.

City Light Plant in Bad Repair

Marion, Ind.—Superintendent Weesner has reported to the Board of Works that the lighting plant is in a bad state of repair and the boilers are so weak that he has had to order the steam pressure reduced from 100 to 90 pounds. Moreover, he says that one boiler is in such bad shape that he is afraid the State Boiler Inspector will soon order its use discontinued.

New Street Lights

Philadelphia, Pa.—Market street between Fifty-first and Fifty-third streets was made bright as day on December 26, when the new high-power gas lamps, which have been installed at short intervals along the sidewalk, were lighted for the first time. From now on this section, which is West Philadelphia's busiest center, will be illuminated nightly. Since the elevated railroad was placed along the street several places have been in its shadow, but the new lamps will dispel all darkness. The lamps have been placed on the street through the efforts of the merchants whose stores line the thoroughfare, led by Frank L. Davis, chairman of the Executive Committee of the Fifty-second and Market Streets Business Men's Association. The property owners have paid one-half of the cost of installation and the merchants the other half. An agreement was then made with the United Gas Improvement Company, whereby the gas company erected new poles of a pattern not heretofore seen in this city. They are in the shape of a shepherd's crook and are most attractive in appearance. Each pole carries an incandescent lamp of great power.

Strawberry Point Has Electric Lights

Strawberry Point, Ia.—The switch which sent the electric current through the wires in the streets and into the homes of the town has just been turned on, and Strawberry Point is at last electric lighted. The system is giving excellent satisfaction, with Electrician Andrew Stiles in charge of the plant.

Lighting Department Better Managed under Commission

Tacoma, Wash.—All the dead wood in the city's Light Department has been cut out by Commissioner Lawson of the Water and Light Department. By requiring the men to work full eight hours each day Mr. Lawson has been able to make a saving of the people's money. The following is a comparative statement of the wages paid in the Light Department during September, October and November of 1909 and 1910:

	1909	1910
September	\$10,375.75	\$9,076.95
October	11,177.90	9,330.64
November	10,763.55	9,431.70
Totals	\$32,317.20	\$27,839.29

The figures may be better appreciated when it is made known that many of the employees are being paid better wages than in October and November, 1909. The common clerks in the office, who make out the bills and help keep other records, were advanced \$10 a month Jan. 1, 1910; the linemen were advanced from \$3.85 to \$4 a day; linemen's helpers were given an increase of 50 cents a day; the men who trim the arc lamps were advanced 30 cents a day; the drivers of the wagons in its department were raised from \$2 to \$2.75. By paying the men a little more money the commission found that it was able to get much more work done. An increase of 10 per cent in wages increased the amount of work accomplished 50 per cent. Fewer men were found to be needed.

FIRE AND POLICE

Civil Service for Birmingham Police

Birmingham, Ala.—Chief George Bodeker, of the Police Department, has had prepared a Civil Service bill to be presented to the Legislature, which, if adopted, will entirely remove the Police Department from politics, and protect the members of the department from removal without cause. The terms of the bill include the Chief of Police as well, making his term and that of all other officers indefinite so long as he is not convicted on due trial of bad behavior or inefficiency.

May Use Freight Tunnels for High-Pressure Pipes

Chicago, Ill.—Plans for a high-pressure water system for fire protection are being made under the direction of Commissioner of Public Works Mullaney. Henry A. Allen, consulting engineer for the city, has been making a study of the subject for weeks. George M. Wisner, engineer for the sanitary district, has suggested that a great saving in cost of laying the pipes could be effected by placing them in the freight tunnels of the Illinois Tunnel Company. Electricity to be supplied by the Sanitary District is the only motive power being considered for operating the high-pressure pumps.

Corpulent Policemen Must Go

Columbus, O.—No more corpulent policemen are to be retained on the Columbus police force. Mayor George S. Marshall has given his ultimatum to that effect. "We simply cannot keep these physically deformed and inefficient men on the force," said the Mayor. "But we will give them a chance to qualify. They have free use of the gymnasium at the police headquarters, where by proper exercise they may reduce their weight and make themselves available; if they don't do it they must retire."

Truck Breaks Guy Wire; Fire Alarm System Out

Elizabeth, N. J.—A truck said to belong to McCloud & Brennan struck a guy wire attached to a pole near the Cherry street bridge, and caused the fire alarm system throughout the city to become demoralized for more than an hour. The accident occurred at 3:10 p. m. The truck, which bore a large housing to be used in covering an engine used to hoist sewer pipes, had just crossed the bridge and was going up the Cherry street hill when the horses, losing their foothold, slipped, and the wagon was thrown against the guy wire. The pole, having no support and containing a large number of wires and a fire alarm station, fell over and caused an open circuit. The authorities were at once notified of the accident and soon had a force of men on the scene. At 4:31 p. m. the damage had been repaired, and a test was made, which showed that the fire alarm system was again in working order.

Trolley Cuts Fire Hose in Two

Long Branch, N. J.—At a recent fire one length of chemical hose was cut to pieces and the couplings on another length destroyed by a trolley car. The motorman paid no attention to Fire Marshal Durham's warning to stop the car. The matter is being investigated by Chief of Police Layton.

Leggins to Be Tried Next Week

New York, N. Y.—Trial of leggins on patrolmen on the traffic and bridge squads is to be made next week. A few will be purchased and the general effect noted. The comfort of the men and their appearance will be taken into consideration in arriving at a decision.

Motor Truck for Brooklyn

New York, N. Y.—That the New York Board of Fire Underwriters is convinced that the day of horse-drawn fire apparatus is past is evidenced by the fact that within a few days there will be in operation at Station No. 1 of the fire patrol, until recently known as the salvage corps, No. 12, Dean street, Brooklyn, a new 40-horsepower automobile fire truck, the first motor-driven fire apparatus provided for that city. A duplicate of this truck was installed by the New York Board of Fire Underwriters in Manhattan about six months ago, and proved so valuable in a short time that no time was lost in providing one for Brooklyn.

Accidents Due to Confusion of Auto Horn Sounds

Fort Worth, Tex.—Fire Chief Bideker is much perturbed over causes for which he sees no remedy. Several recent collisions between street cars and fire apparatus is due, the Chief thinks, to the closed vestibules of the street cars which prevent the motormen from hearing the gongs or auto horns of the approaching fire wagons. As the State laws required the closed vestibules for the protection of the motormen and conductors in inclement weather the fire department will have to run the risk. When there was an audible alarm it was the common practice for drivers of vehicles and motormen on the cars to stop until the fire apparatus had passed. Now unless the coming of the fire machines is heralded in some way they are not advised of the coming of the fire wagons, to which all are disposed to accord the right of way. Therefore, the chief is helpless in this matter. What makes the whole matter worse in his opinion is the fact, as he asserts, that several automobiles in the city have horns in tone exactly like that of the fire chief's auto, and the big combination fire auto. The motormen, when their cars are not closed, may hear those auto horns, but having heard them so often merely as automobile horns, have ceased to associate that peculiar style and tone of horn with the fire department, and hence pay no attention to the fire apparatus until it is too late. Chief Bideker is now asking if he can not have an ordinance passed that will prevent the use of a horn on an auto other than the fire apparatus of the same tone and style of blowing. He has invented for his auto a peculiar staccato style of tooting that is distinguished from any other in the city, unless imitated. If it is he will try, if it is possible, a prosecution for malicious mischief.

Stops Hydrants' Use in Street Cleaning

Newark, N. J.—Fire Chief Astley was incensed by the discovery that street cleaners in the vicinity of the "Four Corners" and elsewhere in the city are drawing upon fire hydrants for water used in sprinkling before cleaning. Supplemented by General Superintendent of Works Shipman he ordered the cessation of this practice. The policemen were instructed to arrest any street cleaner who violates the order. The discovery was made while the chief was on a tour of inspection. Subsequently, with Mr. Shipman, in an automobile, further evidence was obtained. The chief complains that this opening of hydrants by men unskilled in the knack of closing them properly invites the peril of freezing, that would be disastrous in case of fire.

High Pressure on East Side

New York, N. Y.—The great East Side is soon to be included within the high-pressure zone. Inside of two weeks, Fire Commissioner Waldo says, three new areas of high-pressure service will be ready. One of the new areas is on the West Side and is bounded by Twenty-second and Sixteenth streets and Tenth and Seventh avenues. Another new area is bounded by Twentieth and Fourteenth streets, Broadway and Lexington avenue. The largest of the three new lots is bounded by East Houston street, the Bowery, James street and the East River. This includes territory that is the most congested as regards population of any part of the city, and the chance of any fire therein getting away from the firemen is very slim. The pumping stations already constructed and operated in connection with the high-pressure pipes now in use will supply ample pressure for the new system.

Fine Black Team for New Engine

Grand Rapids, Mich.—The Board of Police and Fire Commissioners has purchased three handsome black horses for the new engine at No. 1 fire headquarters on La Grave street. The horses weigh 1600 pounds each, and cost \$300 apiece. Captain Isaac Louke and ten men will have their quarters in the building, which is also new.

Fire Protection for Unincorporated Village

Old Fort, O.—This town will soon be on equal footing with its neighbors in the way of fire protection. Although not incorporated, the citizens subscribed to a fund and purchased a chemical engine, hose and ladders. A building to house the same is now under construction and will soon be ready for occupancy.

GOVERNMENT AND FINANCE

Commission Government Loses in Chickasha

Chickasha, Okla.—Out of a total vote of 1,183 the proposed charter carrying the commission plan of government lost at the special election by a majority of 87. The defeat is ascribed directly to the labor organizations, which, though favoring a commission government for the city, refused to accept various terms of the proposed charter.

Concord Holds Novel Election

Concord, N. H.—The first municipal election in Concord under the new city charter was held Dec. 20. Under the new arrangement two candidates for mayor are selected at a preliminary election open to all persons declaring their candidacy, and the field of candidates for minor offices is similarly narrowed by the preliminary election. The new city government will consist of a mayor, three assessors and a single board of aldermen consisting of six aldermen-at-large and one alderman from each of the nine wards.

Louisville Has a New Seal

Louisville, Ky.—Mayor W. O. Head has signed the ordinance which made the design, secured by the Convention and Publicity League in competitive contest for a \$50 prize, the official seal. Among those who voted for the repeal of the old seal ordinance, enacted May 6, 1861, was Councilman Charles G. Russman, a nephew of Henry Miller, designer of the old seal, who died March 30, 1905. It was decided to supplant the old seal device because it was no longer representative of Louisville's motto, "Progress," inasmuch as the central figure was an old, antiquated, wood-burning locomotive of the type used in '61. The seal which has become the official signature of Louisville was designed by J. R. Bausched, and was selected from more than 100 drawings.



Belton Combines City Offices

Belton, Tex.—The City Council is practising economy in municipal affairs by adopting an ordinance consolidating the offices of Mayor and City Recorder, effective April, 1911, upon the expiration of the term of office of the present City Recorder. An ordinance has also been adopted placing the salary of the Mayor at \$5 a month, with fees of office and allowing the Aldermen a stipend of the same amount minus the fees.

Want Salaries Reduced

Denison, Tex.—Notice has been published that application will be made to the next Legislature to amend the charter of the city to reduce the salaries of aldermen from \$1,500 a year to \$600 a year and to reduce the salary of the mayor from \$1,800 a year to \$900 a year, also to increase the number of aldermen from two to four. Mayor Acheson recently published a statement advocating a change of this kind, but the application to the Legislature will be made by private citizens, according to the notice published. The present city government consists of a mayor and two aldermen.

Bond Issues Invalid

Jamestown, N. Y.—At the last meeting of the Jamestown Common Council the aldermen were startled by an opinion by Corporation Counsel Benjamin S. Dean to the effect that bond issues of the city of Jamestown aggregating nearly a million dollars were invalid because in none had provision been made for raising a sinking fund and interest by annual tax as required by the general municipal law. A \$600,000 issue of water bonds is not included in this opinion. Attention has been called to the defect by the law firm of Caldwell & Reed, attorneys for W. C. Langley & Co., of New York, who examined the records for a \$40,000 issue of hospital bonds which the firm had agreed to purchase. Mr. Dean recommends a legislative enactment to validate the other bond issues on which the city has secured and used the money.

Recall Feature Applied to Appointive Officers

Los Angeles, Cal.—A new feature in the revision of the city charter now going on applies the recall feature to all offices, whether elective or appointive.

STREET CLEANING AND REFUSE DISPOSAL

Garbage Disposal and Hog Feeding

Los Angeles, Cal.—An ordinance has been prepared regulating the disposal of garbage and the feeding of hogs throughout Los Angeles county. It provides that no garbage can be burned except in a furnace or crematory, unless dry, so that there will be no offensive odors from it; that it cannot be transported except in water-tight, metal-lined receptacles, wagons or cars, which must be cleaned daily and disinfected at least once a week; that if fed to hogs, it must be in trays and not on the ground, and that all refuse must be removed and not allowed to generate offensive odors. Hog yards are regulated by the proposed ordinance only when more than 100 hogs are kept, and then a permit must be obtained from the board of supervisors. The yards must be large enough to permit 60 square feet for each hog, not counting young pigs. Penalties for violation of the ordinance are provided in fines not exceeding \$500 or imprisonment not exceeding six months, or both.

Drain Your Garbage

Milwaukee, Wis.—Health Commissioner Kraft has appealed to housekeepers to drain garbage to prevent it from freezing in the cans. Considerable difficulty was experienced by collectors last week. He also advises the substitution of wooden receptacles for the metal cans during the winter months.

Much Sickness Due to Dust in St. Paul

St. Paul, Minn.—Continued high winds and the absence of snow or rain have created an almost intolerable dust nuisance, and an unusual amount of sickness. Such ailments as sore throat, bronchial coughs, la grippe, and some forms of skin disease are said to be more prevalent than ever before. City Engineer Rundlett says he is keeping the downtown district pretty well covered with calcium chloride, but the material has been used so much faster than usual that the supply on hand is short. The use of the chloride is expensive, too. When the temperature is moderate one tank will cover five or six blocks. In cold weather a tank will only cover three or four blocks. Each tank costs \$7 applied to the street. One sprinkling lasts five or six days under the prevailing conditions.

RAPID TRANSIT

Cannot Prohibit Smoking Without Aid of Ordinance

Fort Worth, Tex.—So many complaints have come into the offices of the Northern Texas Traction Company that the officials are seriously considering the prohibition of smoking on the cars, according to Assistant Manager W. C. Forbess, who says:

The complaints come from women, non-smokers and the smokers who have a discriminating taste which revolts at the combination of odors from "men smoking rank pipes, cabbage leaf cigars, cigarettes of all brands, good domestic, or genuine Havanas in the front vestibule of the P-A-Y-E type of cars, where the smokers can use the front vestibule. It is the opinion of the officials of the company that they can not enforce a rule of that kind; that is, to prohibit smoking on the cars without the aid of a city ordinance. If the Commission will enact the ordinance, the company will do its best to enforce it.

Recommends Interborough Plan

New York, N. Y.—The joint committee of the Chamber of Commerce and the Merchants' Association, of which Seth Low is chairman, has recommended the acceptance by the city of the offer of the Interborough company for subway extension and operation. The report is unanimous and is to the effect briefly that this offer ought to be accepted because the Interborough system would make a great addition to the present subway system, which the city owns, and the city could make better terms with the Interborough company on new operating leases than it otherwise could; and for the further reason that the city would get control of an improved subway system many years earlier than under other conditions.

Discovers Provision for Mileage Tax

North Yakima, Wash.—Rummaging among the city documents, City Clerk Brooker has discovered that the street car company has a clause in its franchise providing for the payment of a certain percentage for each mile traversed by its cars within the city limits, the payments to begin at the expiration of 10 years from date of franchise.

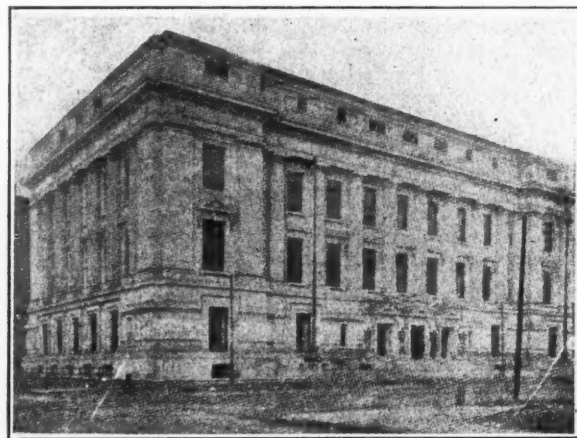
MISCELLANEOUS

Boston Wants Curfew Back

Boston, Mass.—Mayor John F. Fitzgerald has sent to Police Commissioner Stephen O'Meara a draft of the proposed curfew law. The ordinance was drawn up by the Boston Home and Social Association, and provides that all children under 14 found loitering on the streets or parks of the business district after 9 o'clock at night shall be subject to arrest and to a fine not exceeding \$5 for each offense. The ordinance provides that at 8:50 each evening a whistle shall be blown from the City Hall. This gives the children ten minutes to reach home before they are liable to arrest. Members of the association seriously believe the curfew law is necessary for the welfare of the city. Neither the Mayor nor the Commissioner has made public his opinion of the proposed ordinance.

Indianapolis' New City Hall Dedicated

Indianapolis, Ind.—The new City Hall at Alabama and Ohio streets was dedicated last week. Governor Marshall, Mayor Shank and six former mayors made addresses at the ceremonies in the quarters that are to be occupied by the



NEW CITY HALL, INDIANAPOLIS, IND.

public office of the city controller. The building is a four-story and basement structure, the exterior being of Indiana Bedford stone on a granite base. The public lobby or corridor of the first floor is of marble with large imitation marble pillars. The cost of the building was about \$670,000, exclusive of furniture and grounds. The very satisfactory architectural treatment will be noted in the illustration.

Four Towns May Make City

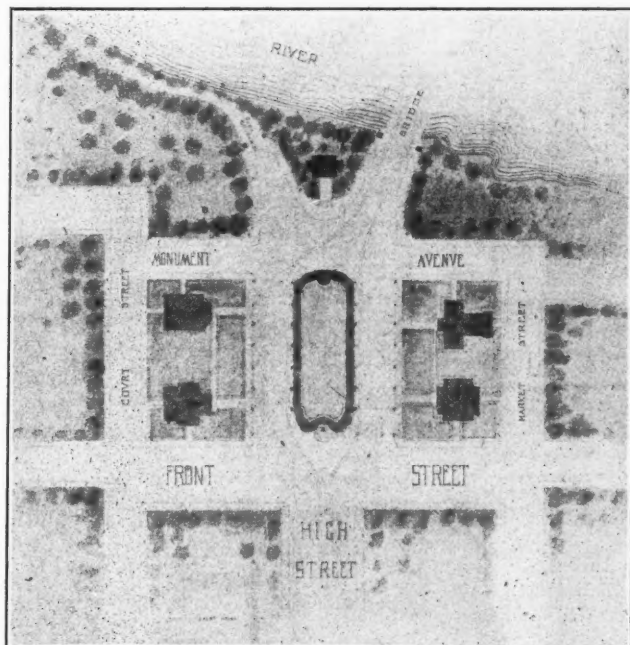
Scranton, Pa.—There is a well-defined movement on foot to give Lackawanna County another city of the third class. The inhabitants of the boroughs of Olyphant, Blakely, Dickson City and Jessup seek to carve a city out of their respective municipalities. These four boroughs are among the largest in the county and are built together. Fathers of the city movement point out that the area of the proposed municipality would be a trifle over four square miles, and that the town would start existence with a population of over 25,000. Better police, fire and school service are the arguments being used by the promoters of the plan.

Municipal Cemetery for Milwaukee

Milwaukee, Wis.—A municipal cemetery is the latest proposed innovation of the administration, according to plans being discussed in the City Hall. It is said that the plan has attained sufficient encouragement to warrant the Council in asking the Legislature to pass a bill which will give the city the right to engage in such an undertaking. Surveys of land beyond the limits have been made by one of the assistants in the engineer's office with a view of securing a site of about 100 acres. The proposition is to sell burial lots at cost, the same as land for dwellings will be sold if a bill which will be presented to the Legislature is passed. Administration members say the high cost of burial lots sold by churches warrants the city in entering such a field.

Proposed Civic Center for Hamilton

Hamilton, O.—Architect F. G. Mueller, Hamilton, has planned the civic center in the accompanying illustration for the city of Hamilton. It includes the land west of the east side of Front street to the river, the south side of Court street, to the north side of Market street, together



PROPOSED CIVIC CENTER, HAMILTON, O.

with the west river bank. It affords sites for six public buildings, three of which will probably soon be built, City Hall, Library and High School. Questions of cost and method of procedure will be considered by a committee appointed by George T. Reiss, president of the Chamber of Commerce.

Talking Up Public Parks in Middletown

Middletown, Conn.—A special meeting of the Common Council was held last week, at which the report of the special Committee on Parks was made. It was a lengthy report, and after relating the occasion of their appointment and the meetings they have held, the majority of them declared in favor of an amendment to the city charter that will permit the establishment here of a Park Commission. They submitted a table showing that the extra tax caused by the establishment of the commission and the carrying out of plans for a Park Commission would need to be but three cents on \$100 and 30 cents on \$1,000. In a general way the proposed amendment is patterned after the Hartford charter, except that the commission is not made self-perpetuating. This report was accepted and later will be submitted to the people.

Municipal City Plan Approved

Minneapolis, Minn.—Plans for a civic centre and the development of Minneapolis, as prepared by E. H. Bennett, Chicago, which, if carried out, may make Minneapolis the most beautiful city in the world, were last week approved by the Civic Commission, an advisory body of representative citizens from various public organizations, which has had the matter in hand for nine months. The draft submitted and approved was a completed one, embodying every feature of a scheme which members of the commission believe would result in a perfect city. Hitherto the plans have been considered in fragments. The scheme provides for the elimination of grade crossings and equalization of the river banks, the widening and beautifying of Lake street and the parking of Franklin avenue from Nicollet avenue across the river to the eastern city limits. Other streets are to be widened and numerous boulevards provided for, while a wall will be laid out around which the park systems and cross boulevards will be linked. Fred B. Snyder is chairman of the commission, and William Pierce Cowles, consulting engineer.

Parks and Playgrounds for Cincinnati

Cincinnati, O.—Children can have playgrounds and grown-ups can have parks because the Supreme Court of Ohio has decided that the Hamilton County \$1,800,000 bond issue, representing breathing places for many, is valid. The decision is sweeping, in that it affirms the Common Pleas Court and the Circuit Court. It is the official stamp on the bond issue. The Board of Commissioners received notice through City Solicitor Ballard that if a purchaser is found in the course of a few weeks park improvements will be started in the spring. Many bonding companies are anxious to float the securities. Back of the playground movement is the Cincinnati Turngemeinde. It is the desire of that organization that the city may be provided for well, but the congested districts must be taken care of first. Policing of the parks will be reorganized. The park commission will employ its own police. The reorganization of the board because of the new term of Commissioner Gilbert was effected with L. A. Ault, president; William Gilbert, vice-president. Secretary Longenecker was re-elected by the board. The lighting of the parks, heretofore carried in the general street lighting contract, hereafter must be provided for by the park commissioners, as the city solicitor has held that the director of public service cannot enter into a contract for the park board. The new lighting contract goes into effect June 1, 1912, when at the same time the park board will have to enter into a contract for the parks.

Want Municipality to Publish Newspaper

Los Angeles, Cal.—With a charter mapped out providing for public ownership of public utilities, even including a steam railway and a steamship line, the latest idea of the Good Government city administration is a municipal newspaper. The question whether the charter shall be amended to give the city authority to maintain such a publication will be submitted to the voters at a special charter election in February. The Good Government people decline to give out any details regarding the proposed unique journal, which would be the first of its kind in the country, but it is understood the plan is to make it a daily, handled along metropolitan journalistic lines, with the City Council as a board of directors, the heads of the principal city departments, such as the Board of Public Utilities, of which Meyer Lissner is chairman, as editors, and the Mayor as editor in chief. A department of printing would, of course, be created. Among the daily items would be the municipality's advertisements, but these are trifles to be adjusted after provision is made in the charter.

Plan Municipal Exhibit

Philadelphia, Pa.—In preparation for the municipal exhibit which is to show the achievements of the present administration and unfurl the comprehensive plans for a greater Philadelphia, two rooms in the third floor of the City Hall have been placed at the disposal of the Survey Bureau, which is to direct the preparation of drawings, blue prints, clay models and photographs that will enter into the collection that will eventually be displayed in a public hall or auditorium. The idea advanced by the Mayor, when he sent his request to Councils a few weeks ago for an appropriation of \$30,000, was to place \$20,000 of this for use by the Survey Bureau and \$10,000 at the disposal of his office for the furtherance of plans for the exhibit. It is said that the original and advance plan is to have an exhibit about the time that the National City Planning Association meets in this city. The date is fixed for some time in March, but the Mayor, for the purposes of displaying his exhibit, desires that this convention be held in May. Later, during the week of October 4, at the Founder's Week celebration, it is proposed to have an elaborate exposition of the municipal government. This is to include a display of model sewer sections, showing the method of construction, specimens of materials used in street repairs, and the supplies, such as uniforms of policemen and firemen, and other materials purchased by the city. One of the principal features is to be an exhibit of a model municipal transportation system, including subways and suburban systems connected with a central system. The entire exhibit is to show that the present administration has accomplished more than the public is inclined to credit it with, and the solution of the transit problems is to be the monument of the Reyburn administration.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Comfort Station—Injury to Person Using

Pitman vs. City of New York.—Where New York City authorities, under power expressly granted by Greater New York Charter, established a comfort station in accordance with plans calling for rough-axed granite steps leading thereto without a handrail or tooling or protection of the steps by metal or rubber treads, and it appears that two years after the station was opened the steps were "pretty smooth," and that at the time of an accident from slipping thereon one year later they appeared very smooth, slippery and damp, it was for the jury to determine in an action for the injuries, if they found that they were caused by the condition of the steps, whether such condition was due to the negligence of the city authorities in failing to tool the steps or otherwise protect the users thereof against slipping on them.—Supreme Court of New York, 125 N. Y. S., 942.

Public Improvements—Rights of Materialmen

National Iron Works vs. City of Monroe et al.—In the absence of collusion between a city and a contractor for a public work, entitled under the contract to partial payments, to defeat the claims of materialmen by making excessive payments on inflated monthly statements, the court must presume that the estimates on which the payments were made were correct, so that the payments were binding on the materialmen notwithstanding Civic Code, making the owner making excessive payments to the contractor liable to materialmen and laborers.—Supreme Court of Louisiana, 53 S. R., 563.

No Authority to Grant Perpetual Utility Franchise

City of Joseph vs. Joseph Water Works Company.—A municipality has no authority to grant a perpetual utility franchise. Where a municipality granted a water company in one section of its franchise unlimited rights to lay pipes, etc., and in another section limited this right to 15 years, the limitation will be upheld, for a municipality has not a right to grant a perpetual utility franchise and will not be presumed to have intended to so do, and another construction would render the latter section meaningless.—Supreme Court of Oregon, 111 P. R., 864.

Assessment—Right to Injunction

Jenkins vs. Oklahoma City et al.—Unless the whole assessment for the purpose of grading, draining, curbing and paving a street is void, a case for injunction cannot be maintained, for he who seeks equity must do equity. If any part of the assessment against the owner's land is valid, he cannot have an injunction unless he has paid or offered to pay such part as is valid.—Supreme Court of Oklahoma, 111 P. R., 941.

Public Water Rates—Discrimination

People vs. Albion Water Works Company.—In proceedings by the State to enjoin defendant water company from ceasing to deliver water to a public institution unless paid a certain rate, on the ground of unjust discrimination, it appeared that defendant was engaged in the business of furnishing water to the village of A., and it alleged that at its own expense, on request of public authorities, it laid a line from its main to said institution, situated in the town, but not in the village, of A., and that it was reasonably worth the sum sought to be charged to furnish water to the institution. Held that, while the rates charged in the village might be considered, the test was whether the rate sought to be charged was reasonable, and defendant was entitled to show facts tending to support its averments.—Supreme Court of New York, 125 N. Y. S., 589.

Contracts—Statutory Provisions—Surety

O'Rourke Engineering Construction Company vs. City of New York.—The surety of a contractor who was declared in default took over his work and completed it and did certain work on a supplemental contract. Before the executed contract was delivered, the requirements of Greater New York City Charter, Sec. 419, that there should

be an unapplied and unexpended appropriation and a certificate to the Comptroller to that effect, were completed, and the surety, without waiting for the city officials to perform the ministerial acts necessary to give validity to the contract, proceeded with the work. Held, that the surety could recover upon the contract, the requirements of section 419 having been complied with, the city not being harmed by the fact that the surety proceeded with the work, running the hazard of receiving fair treatment.—Supreme Court of New York, 125 N. Y. S., 664.

Damage to Property—Limitation

Harms vs. City of New York.—Section 261, Greater New York Charter, provided that claims against the city for damages for injuries to personal property or the destruction thereof by reason of the negligence of the city or its department shall be barred unless action be brought within one year. The plaintiff rented a scow to the city which was injured through its negligence. He then brought an action on the contract of bailment. Held, that the aforesaid rule did not apply, being limited by its terms to actions arising by reason of negligence, and this action was based on the contract.—Supreme Court of New York, 125 N. Y. S., 477.

Defective Streets—Contributory Negligence

Hunter vs. City of Montesano.—A pedestrian, who, on a dark stormy night, knowing that M street was being paved, contained piles of materials, was torn up and not in a condition to be traveled by teams, and that a barrier was across it on the south side of D street, and another a block further south, crossed it on the north side of D street, and, after going north a piece on M street, returned to D street, and, instead of recrossing where he had crossed, went further south and attempted to recross diagonally in the middle of the block between the two barriers, keeping his eyes on a light in a store, was guilty of negligence, barring recovery for his injury from running into a plank resting on material and rubbish.—Supreme Court of Washington, 111 P. R., 571.

Parks—Ocean Front—Boardwalks

Crossan vs. Ventnor City.—An act to enable cities in this State located on or near the ocean and embracing within their limits or jurisdiction any beach or ocean front to open and lay out a public park or place for public resort or recreation on and along the beach or ocean front of such city, etc., defines in its title and body "ocean front" as meaning as much of such front as is within the territorial limits or jurisdiction of such city. The proviso by which boardwalks theretofore constructed to the landward of the high water line are excepted from the prospective operation of the act does not make it special or in excess of the object expressed in its title.—Supreme Court of New Jersey, 78 A. R., 12.

Right to Drain Land—Consent of Property Owners

Hart vs. Village of Adams et al.—The assent of property owners to have water drained across their land by ditches dug by a village gave the village no right to continue such drains, after the owners objected to their continuance, so that their continuance could be enjoined; the village not having the right to maintain the ditch without the property owners' consent.—Supreme Court of New York, 125 N. Y. S., 652.

Civil Service—Illegal Removal of Veteran

Barton vs. Brennan et al.—Where relator, a veteran, was appointed General Inspector of Construction in Bellevue and Allied Hospitals, and his salary was duly fixed, and he was removed when the building to which he had been last assigned as inspector had been completed, and there was work requiring his functions, he was entitled to be reinstated and reassigned to it, in preference to another, appointed to the same office at a later date, who is not a veteran.—Supreme Court of New York, 125 N. Y. S., 691.

Notice of Injuries—Not Unreasonable Requirement

Tonn vs. City of Helena.—Revised Codes, requiring notice to municipalities of injuries received by reason of defective sidewalks, is not an unreasonable classification, and the act is not invalid as class legislation in not applying to all others who may be defendants in personal injury actions.—Supreme Court of Montana, 111 P. R., 715.

NEWS OF THE SOCIETIES

City Engineers of North Dakota.—City engineers of North Dakota will hold a meeting in Fargo January 17 and 18, City Engineer H. G. Lykken, of Grand Forks, being one of those backing the movement. The program arranged includes a number of topics of peculiar interest to the engineers of North Dakota cities. On the first day T. R. Atkinson, State Engineer, will speak on "Roads," E. S. Keene, of the Agricultural College, will read a paper, while Dean E. J. Babcock, of the School of Mines, will talk on "Lignite Coal and Its Possibilities." Prof. A. J. Booker, of the university, will speak on "Concrete," while Prof. H. R. Slo-cum and J. A. Jardine and F. L. Anders will carry out a series of concrete tests. On the second day City Engineer H. G. Lykken, of Grand Forks, will read a paper on "Modern Trend in Water Purification." Prof. E. F. Chandler, of the university, will talk on "Water Supply in North Dakota," while G. O. Sanford, project engineer, will deal with the Williston irrigation project.

Minnesota Surveyors and Engineers Association.—The annual meeting was held in the Senate chamber of the old capitol, St. Paul, Minn., when the following program was carried out:

Morning—President's address, Prof. W. R. Hoag; Report of the Secretary and Treasurer, Charles A. Forbes; paper, "Government Corners," Nathan Butler; paper, "Drainage Project with 250 Miles of Highway," Prof. W. R. Hoag; paper, "Minnesota Resources," George A. Ralph, State Drainage Engineer.

Afternoon—Opening at 2 P. M.—Paper, "Necessity of Good Roads and How the State Should Aid in Building Them," Senator James T. Elwell; "Good Road Instructions," George W. Cooley; paper, "Toncan Metal," F. N. English, of the Stark Milling Co.; paper, "Sheet Steel," American Sheet and Tin Plate Co.; "Peat and Its Usefulness," Max Tolz, St. Paul; Reports of Committees, Election of Officers, Question Box.

League of Third Class Cities of Pennsylvania.—The subcommittee of the Law Committee of the League met at Harrisburg December 30, with Chairman D. S. Seitz, City Solicitor. This committee was named by the Law Committee on Tuesday, following the convention of the league. The committee will direct a measure that will provide for all of the provisions of the 1909 amendments to the constitution relating to the government of third class cities. The general committee has already provided a bill extending the tenure of office of city officials whose terms expire in April to the first Monday in December; also a measure for the election of one assessor next fall and two at the election two years hence.

Municipal Engineers of the City of New York.—At the meeting of December 28 a paper on "The Construction of the Croton Falls Reservoir of the New York City Water Supply" was presented by Mr. Frederick S. Cook, of New York City.

Albany Society of Civil Engineers.—At a meeting at the Ten Eyck December 20 C. V. Merrick gave an address on the rapid rise of the skyline of skyscrapers in the past 25 years and their usefulness from a business standpoint.

American Society of Civil Engineers.—Three meetings for topical discussion will be held January 20 and 21 at the society's house in New York

City. The general subject for the three meetings is to be road construction and maintenance. All engineers, whether members of this society or not, are invited to attend. At the first meeting, on the morning of January 20, three subdivisions will be taken up: (1) Preliminary investigations. (2) Relative value of three methods of carrying on work; (a) that in which both labor and material are furnished by the contractor; (b) that in which the material is supplied by the party of the first part and the labor by the contractor; (c) that in which both labor and material are supplied by the party of the first part. (3) Systems of maintenance. The discussion of the three divisions will be introduced respectively by Logan W. Page, Harold Parker and Hubert K. Bishop. At the second meeting, on the afternoon of January 20, the subdivisions taken up will be the use of water, calcium chloride, light oils, etc., as dust palliatives, and surface treatment with tars, heavy oils, etc. The discussion will be introduced by Samuel Whinery and Charles W. Ross. The use of bituminous materials by penetration and by mixing methods will be the subject for the third meeting, on the morning of January 21, at which the discussion will be led by Walter W. Crosby and Arthur H. Blanchard.

The society has chartered two steamers of the United Fruit Company for the trip to the Panama Canal. One steamer will leave New York on March 2 and will return to New York on March 24. The other will leave New Orleans on March 4 and return to that city on March 21. Both steamers will go directly to Colon, and after a brief stop proceed on the cruise, stopping again at Colon on the return trip. Visitors may take the entire cruise and thus spend but a few days on the isthmus or may remain on the isthmus while the vessel is away, thus affording plenty of time for a careful inspection of the work. The steamship company will reserve the vessel for members of the society until January 15, and each member must make his own reservation.

National Commercial Motor Car Show.—A comprehensive display of motor trucks, delivery wagons and self-propelled road machines for all sorts of industrial purposes is to be held in Chicago during the week of February 6-11 next. It will follow immediately after the annual automobile show, and will occupy the same building and be conducted by the same management, under the auspices of the National Association of Automobile Manufacturers. Power vehicles suitable for almost every kind of industrial and commercial business will be shown, from tricar parcel carriers for the quick delivery service of laundries, haberdashers, boot and shoe stores, confectioners and other retailers of light good to ponderous motor trucks of five tons load capacity or more. There will be light and heavy delivery wagons, express wagons, baggage wagons, mail transfer wagons, light and heavy trucks from one ton capacity up, with open platform, stake, slat and covered bodies. Special forms for unusual purposes will be displayed, such as self-propelled chemical and hose carts for fire fighting, trucks with power winches operated by the motor that propels the vehicle for loading and unloading heavy pieces of machinery and boxes, crates and barrels; trucks with self-dumping bodies for handling building materials,

ashes, etc.; self-discharging coal trucks; patrol wagons, ambulances, sightseeing cars and motor stages.

New England Water Works Association.—The following is the program for the annual meeting, Hotel Brunswick, Copley Square, Boston, January 11:

10:00 A. M.—The headquarters in Tremont Temple will be open for the use of members. 11:30 A. M.—Meeting of the Executive Committee at the headquarters, Tremont Temple. 1:00 P. M.—Lunch will be served at Hotel Brunswick, Copley Square.

2:00 P. M.—Address of Retiring President, Report of Secretary, Report of Treasurer, Report of Editor, Report of Auditing Committee, election of officers, report of tellers appointed to canvass ballots. 3:00 P. M.—Report of the following committees: Committee "To look after and keep track of legislation and other matters pertaining to the conservation, development and utilization of the natural resources of the country," M. N. Baker, Chairman, New York City. Committee "To prepare a standard specification for fire hydrants," H. O. Lacount, Chairman, Boston, Mass. Committee "On information as to the conditions under which extensions of water mains are made by town-owned water supplies," Charles W. Sherman, Chairman, Boston, Mass. Committee "On uniformity of hose and gate-nuts, and direction of opening," Frank L. Fuller, Chairman, Boston, Mass. Committee "To compile information relating to awards that have been made in water works valuation cases," H. W. Dean, Chairman, Boston, Mass. Committee "On library," Charles W. Sherman, Chairman. A paper will be presented on "The Gas Producer Pumping Plants at Manchester, Massachusetts," illustrated by Raymond C. Allen, C. E., Manchester, Mass. George A. King, President, Taunton, Mass. Willard Kent, Secretary, Narragansett Pier, R. I.

Oregon Good Roads Association.—Oregon good roads workers are committed to creation of a highway board and selection of a highway commissioner to serve at \$4,000 a year; to appropriation of \$680,000 by the State for distribution equally among the counties in the coming two years for State-aid road construction; to the raising of \$1,360,000 among the counties for use with the State appropriation in the coming two years in starting good road construction; to the employment of convict labor and all prison labor available in good road work; to the establishment of at least three convict centers in the State, where great rock crushers shall be operated, and the product sold to the counties for road construction at actual cost and to several minor features in road construction, the substance of which was contained in the five bills submitted to the general Good Roads Convention, Portland, December 12, by Judge L. R. Webster.

For the present at least the Oregon road builders are not ready to enter into the interstate boulevard scheme suggested by the Pacific Highway Commission. They do not care to tax one-quarter or any other amount of the cost of road construction to adjacent land or to a specific road district outlined by the county road. They will not leave the selection of a road route to the people at large, but insist that the County Court is the proper power to make such selection. They have not limited the routes for road construction contemplated in the appropriations recommended to one market center, but insisted that the limitation should read "market centers."

In the five measures dissected and reconstructed there are a multitude of provisions which have deep interest. Some of these did not come to the surface in the controversies. One proviso, that the State Highway Commissioner shall have general and supervisory charge of the disbursement of work done with funds raised by selling county bonds, did not crop up for discussion, but is assured prominence in future developments, as many of the counties are going to insist upon at least theoretical independence in their own work which is being met by strictly county funds.

The good roads men do stand for taxing automobiles 25 cents each horsepower a year for machines of 50 or less registered rating, and 50 cents each horsepower for all going above 50 horsepower.

Authority was granted the chairman to name two committeemen from each county of the State further to round out the bills discussed, and then to press these bills upon the Legislature at the coming session. Another committee of five, John H. Albert, of Salem; M. J. Lee, of Clackamas; H. W. Thompson, of Eugene; M. R. Ryan, of Douglas, and F. F. Eddy, of Coos, was named to frame a measure providing for wider tires in the State and to report this measure to the legislative committee.

No permanent Statewide organization was perfected. For the present the Oregon Good Roads Association, as it has been constituted for the last few months, will continue its labors. Dr. A. C. Smith, President; Judge L. R. Webster, Chairman of the Executive Committee, and Walter L. Priest, Secretary, will continue activities.

Colorado Association of Members of the American Society of Civil Engineers.—The association has arranged to have tables reserved at the Traffic Club, Denver, every Wednesday at luncheon for the members of the association and their guests. The privileges of the club will be opened to the association in connection with these luncheons. The first one was held Dec. 14.

Calendar of Meetings

- January 2-6.**
Canadian Society of Civil Engineers.—Annual Meeting, Winnipeg, Manitoba, Can.—C. H. McLeod, Secretary, 413 Dorchester street, West, Montreal, Que.
- January 4.**
American Society of Civil Engineers.—Regular Meeting.—C. W. Hunt, Secretary, 220 West 57th street, New York.
- January 6-7.**
Association of Kansas Police Chiefs.—Annual Meeting, Wichita, Kan.
- January 10-14.**
Organization of City Officials for Standardizing Paving Specifications.—Second Meeting, Engineering Societies Building, 29 W. 39th street, New York, N. Y.—John B. Hittell, Secretary-Treasurer, Chief Engineer of Streets, Chicago, Ill., Hotel Rector, New York, N. Y.
- January 11-13.**
Michigan Engineering Society.—Annual Meeting, Lansing, Mich.
- January 12-13.**
New York Tax Reform Association.—State Conference on Taxation.—A. C. Pleydell, Secretary, New York, N. Y.
- January 12-14.**
Montana Society of Engineers.—Annual Meeting, Helena, Mont.—Clinton H. Moore, Secretary, Leysen Block, Butte, Mont.
- January 12-14.**
National Civic Federation.—Annual Convention, New York, N. Y.—D. L. Case, Secretary, 1 Madison avenue, New York, N. Y.
- January 12-14.**
Indiana Engineering Society.—Annual Meeting, Hotel Denison, Indianapolis.—Charles Brossman, Secretary, Union Trust Building, Indianapolis, Ind.

January 16-20.

Canadian Cement and Concrete Association.—Annual Convention and Exhibition, Toronto, Ont.—R. E. W. Hagarty, Secretary, 662 Euclid avenue, Toronto, Ont.

January 17.

Engineers' Society of Western Pennsylvania.—Annual Meeting, Pittsburgh, Pa.—Elmer K. Hiles, Secretary, 803 Fulton Building, Pittsburgh, Pa.

January 17-19.

American Institute of Architects.—Annual Convention, San Francisco, Cal.—Glenn Brown, Secretary, Octagon, Washington, D. C.

January 18-19.

American Society of Civil Engineers.—Annual Meeting, New York.—C. W. Hunt, Secretary, 220 W. 57th street, New York.

January 20.

Illuminating Engineering Society.—Annual Meeting, New York, N. Y.—P. S. Millar, Secretary, 29 W. 39th street, New York, N. Y.

January 24-26.

American Society of Heating and Ventilating Engineers.—Annual Meeting, New York, N. Y.—W. M. Mackay, Secretary, P. O. Box 1818, New York, N. Y.

January 24-26.

Ohio Engineering Society.—Annual Meeting, Columbus, O.—C. J. Knisely, Secretary, New Philadelphia, O.

January 25-27.

Illinois Society of Engineers and Surveyors.—Annual Meeting, East St. Louis, Ill.—E. E. R. Tratman, Secretary, 1636 Monadnock Block, Chicago, Ill.

February 1-3.

Nebraska Cement Association.—Western Cement Exposition, Omaha, Neb.—Peter Palmer, Secretary, Oakland, Neb.

February 6-11.

National Brick Manufacturers Association.—Annual Convention, Louisville, Ky.—T. A. Randall, Secretary, Indianapolis, Ind.

May 29.

American Water Works Association.—Annual Convention, Rochester, N. Y.—J. M. Diven, 14 George street, Charleston, S. C.

May.

City Commission Congress.—Meeting, Galveston, Tex.—Mayor Lewis Fisher, Chairman of Committee, Galveston, Tex.

PERSONALS

BERGER, VICTOR, Alderman-at-large of Milwaukee, Wis., who has been elected to Congress as a Socialist, will qualify for Congress March 4, but will not draw his salary as a municipal officer after that date, even though he continues to serve the city until the convening of the new Congress next December. The National position pays \$7,500 and the city \$100.

BRUSKI, L. J., Winona, Minn., has been appointed Street Commissioner.

CHARLES, SALEM D., Chairman of the Street Commission, on which he has served for ten years has been certified to the Civil Service Commission for reappointment to a three-year term by Mayor John F. Fitzgerald, the other members are James J. Gallivan, recently reappointed, and John H. Dunn, whose term expires in 1912.

COUNTY ENGINEER.—The Road Commission of Union County, Mississippi, will receive applications at once for the position of County Engineer, to take charge of the construction of sand-clay and other roads. Applicants should state age, experience, education and salary desired, and give references. Communications should be addressed to Mr. W. G. Bias, Chairman of the Union County Road Commission, Route 1, New Albany, Miss.

FISHER, IRA M., Superintendent of the plant of the Massillon Electric & Gas Co., Massillon, O., for 25 years, has resigned in order to devote his entire time to the business of the Fisher Electric Company of Massillon, of which he is President.

FOYE, EDWARD H., Lowell, Mass., has been elected Purchasing Agent over Alderman Smith J. Adams.

HERING, RUDOLPH, and GEORGE W. FULLER, consulting engineers, New York, and Dr. L. L. Lumsden, of the Public

Health and Marine Hospital Service, are investigating the cause of typhoid fever in Des Moines, Iowa.

JENNE, FRANK A., Prosser, Wash., has been appointed supervising engineer in charge of the construction of the sewerage system of that city.

JOHNSTON, CLARENCE I., State Engineer of Wyoming, has been appointed professor of surveying in the University of Michigan. Mr. Johnston was graduated from this institution in 1895 and received the degree of civil engineer in 1899.

KELSEY, LOUIS C., Portland, Ore., consulting engineer, has opened an office in Portland and will give special attention to the designing of waterworks, sewerage systems and pavements. Mr. Kelsey will be located in the Madison Building, 250 Third street, until March, after which his permanent office will be in the Selling Building. He will also retain his office, 412 Dooley Building, Salt Lake City, Utah.

MACVICAR, JOHN, Des Moines, Iowa, has been appointed commissioner general of the International Municipal Congress and Exposition, to be held in Chicago, September 18-30, 1911.

SEBASTIAN, CHARLES E., Los Angeles, Cal., has been appointed Chief of Police.

SEYGERLICH, CHARLES, Chicago, Ill., has been appointed Fire Marshal, succeeding the late James Horan.

SERM, ALFRED, Milwaukee, Wis., has been appointed free warden and superintendent of the new nursery and experimental garden in Evergreen Park.

STOLL, PAUL, Red Bluff, Cal., has been elected Chief of the Fire Department, succeeding H. C. Wietfeldt, who has been Chief for nineteen years. Mr. Wietfeldt declined another election.

THOMAS, J. BOSBY, Baltimore, Md., has been appointed chemist and bacteriologist for the water department.

WHITFORD, NOBLE E., Albany, N. Y., resident engineer of the New York State Engineer's office, delivered an address at Watkins, N. Y., December 14, on the construction of the Barge Canal.

WILCOX, W. F., Meridian, Miss., has resigned as superintendent of the Meridian water works system to accept the position of assistant chief engineer of the Tennessee Coal, Iron & Railroad Company, at Birmingham, Ala.

Massachusetts

Beverly—Frederick A. Dodge, former Alderman, over William Stafford, Sumner E. Glines and Jeremiah F. Desmond.

Chicopee—Sol. E. Fletcher, over Frank A. Rivers.

Everett—Herbert P. Wasgatt, without opposition.

Lowell—John F. Meehan, over former Policeman and Mayor George H. Brown and Carroll.

Lynn—William P. Connery over Mayor James E. Rich for Mayor and Commissioner of Public Safety; Frank A. Turnbull elected Commissioner of Finance; George H. McPhetres, Commissioner of Streets and Highways; Thomas Campbell, 2d, Commissioner of Water and Water Works; Herbert C. Bayrd, Commissioner of Public Property.

Malden—George H. Fall over Dr. George L. Farrell and Calvin M. Verbeck.

Medford—Charles S. Taylor, without opposition.

Melrose—Eugene H. Moore, for fifth term without opposition.

Newburyport—Robert E. Burke over Hiram L. Langford and Fred E. Green.

Newton—Charles E. Hatfield.

Salem—Alderman Rufus D. Adams over former Mayor J. F. Hurley, who will continue as Alderman; Alderman Wm. H. McSweeney, Herman F. Curtis and Alderman John J. Cahill; Mayor Arthur Howard was elected an Alderman.

Somerville—Charles A. Burns over Thos. F. Nolan.

Woburn—Hugh D. Murray over Alderman Harold P. Johnson by 28 votes.

Worcester—James Lozan for fourth term, over David F. O'Connell by 124 votes; contest probable.

TRADE NOTES

Cast Iron Pipe.—Chicago: Western cities are slow in advertising their specifications. The more favorable market for municipal bonds is encouraging. Quotations: 4-inch, \$27; 6 to 12-inch, \$26; 16-inch and up, \$25, Birmingham. It is expected that competition for some large lettings in February at Pacific Coast points will be keen on account of the large accumulations of stocks. Quotations: 4 to 6-inch, \$19 to \$19.50; 8 to 12-inch, \$18 to \$18.50; over 12-inch, average, \$17, New York. Quotations: 6-inch, carload lots, \$22.

Lead.—It is now generally believed that lead is scarce. Quotations: New York, 4.50c.; St. Louis, 4.35c.

Oregon Fir for Pavements.—The Oregon and Washington Lumber Manufacturers' Association, Portland, Ore., has appointed a committee to take up a study of wood block pavement. It is hoped to greatly increase the use of fir for this purpose, though as yet but a comparatively small amount has been tried. In cutting fir there is a loss of about 25 per cent of every tree, as the tree tops are not now used, except to a small extent by box factories. It is this waste material which the lumbermen's organization hope to see used for paving blocks.

Road Machinery.—The addition to the boiler shops of the J. I. Case Threshing Machine Co., Incorporated, Racine, Wis., is just being completed. This is a building 60 ft. by 215 ft., which will be used exclusively for a stock room for the Case boiler shops. A boiler storage has been completed 230 ft. by 60 ft. This is equipped with a traveler for movement of boilers from one part of the building to another. Under the supervision of the Case architect the above work has been undertaken and completed, also the remodeling of the Garfield warehouse, which is 100 ft. by 250 ft. and two stories high. This building, when the remodeling is completed, will be used as a machine shop. Machine shop facilities have not been adequate. As soon as the weather will permit, other buildings will be put under construction by the Case architect and completed. The heavy business for the present year has necessitated all these changes.

Stone Crusher Patents.—Thomas A. Edison, the inventor, is suing the Allis-Chalmers Company, the Empire Limestone Company and the Caspan Stone Company in the United States Court, Buffalo, N. Y., for damages for alleged infringement on one of his patents for a stone crusher.

Concrete Surface Finisher.—The Vulcanite Portland Cement Company, Land Title Building, Philadelphia, Pa., has published with handsome colored illustrations a paper by Albert Moyer on concrete surface finisher. One of the most handsome finishes illustrated is made with 1/4-inch white marble screenings, 1/2-inch red marble and 1/2-inch black marble and Cow Bay sand. The proportions used were: 1 part Vulcanite Portland cement; 2 1/2 parts Cow Bay sand; 2 parts red marble and 1 1/2 parts of black marble.

Pipe Joints.—The Best Manufacturing Company, Pittsburgh, Pa., in circular No. 3 illustrate the various types of pipe joints which this firm is prepared to furnish. The different styles include screwed joints, welded joints, the Van Stone joint, bronze unions and special types of joints for hydraulic work.

Water Company Reorganization.—A syndicate of local capitalists is seeking to purchase a controlling interest in the Bristol (Conn.) Water Company. The negotiations have been under way for some time, and it is stated that options have been secured on more than 51 per cent of the stock, the amount required. The necessary amount of money to take this stock over is practically subscribed for. The company was organized 26 years ago and is capitalized at the present time for \$200,000, one-half of which came through the issue of stock as dividends. There are outstanding bonds to the amount of \$100,000. The present dividend rate is 5 per cent. The company owns four reservoirs, situated in this town and Harwinton, and has storage capacity enough to meet the needs of the town for a number of years to come. There will be a petition presented to the next Legislature asking that an act be passed which will permit the town to purchase the rights and privileges of the company. If the syndicate gains control, as it now seems likely that it will, it is said that this measure will not be opposed. However, the town will be asked to desist from voting to take the company over until an opportunity is given the new interests to demonstrate that the company can furnish water to users as low as any municipal or private owned company in the State, in which event there would be no reason for the town to go into the water business.

Water Company Reorganization.—The Rochester & Lake Ontario Water Company was reorganized at a meeting of the Board of Directors December 21. Henry C. Brewster was elected treasurer and Alexander Russell was named secretary. The two positions were formerly held by George K. M. Clarke, who absconded after embezzling \$40,000 of the company's funds. Alvin H. Dewey was elected vice-president in place of William F. Balkam, resigned. The following is the new Board of Directors: Henry C. Brewster, president; Alvin H. Dewey, vice-president and general manager; Alexander Russell, secretary; Henry C. Brewster, treasurer; V. Moreau Smith, A. B. Lamber-ton, Frederick W. Zoller, William F. Balkam, Andrew H. Bowen and Merton E. Lewis. The new director is Frederick W. Zoller, of the Union Trust Company. Alvin H. Dewey will have general charge of the management of the company.

Water Company Increases Capital.—The Richmond City Water Works Company, Richmond, Ind., has increased its capital from \$375,000 to \$550,000. The increase is made to provide for future improvements of the plant and will be issued from time to time.

Gasoline Fire Engine Test.—William M. Johnson, engineer for the National Board of Fire Underwriters, has made the following report on tests of the Westinghouse gasoline fire engine, recently delivered to the city of Cohoes:

Drafting water through 20 feet of suction and pumping through two lines of 200 feet each, slamed into a 3 1/2-inch line with a 1 1/2-inch nozzle, the engine developed a pressure at the pump of 82 pounds and threw an average of 494 gallons a minute, for twenty minutes.

Pumping from a hydrant with a pressure of 42 pounds, the engine threw an average of 705 gallons a minute for a test of sixteen minutes.

When attached to hydrants which give the engine about 30 pounds pressure to start with, it should be able to supply two good 1 1/2-inch fire streams through 400 or 500 feet of hose.

Gurley's Manual.—The forty-fifth edition of Gurley's Manual of American Engineers and Surveyors Instruments, manufactured by W. & L. E. Gurley, Troy, N. Y., has been published. It is primarily a book of instructions in the adjustment and use of field instruments, and while it does not attempt to take the place of treatises on the subject, it is generally sufficient for students and young engineers and is frequently used by them. The illustrations in colors of the instruments are attractive and make it easy to understand the instructions. Some of the instruments described might be of practical use in their daily work to others than surveyors, for instance, contractors, superintendents and foremen. The telescopic hand level, the angle mirror and the tally register are among these. The book is ordinarily sold for 50 cents.

New Floor Preparation.—The Wilson & Baillie Manufacturing Company, 26 Court street, Brooklyn, has taken the agency for the United States of "Terrano," a magnesite floor preparation made according to a German formula and used to a considerable extent in Canada, where the rights are controlled by the Eadie-Douglass Company, of Montreal. The Wilson & Baillie Company will lay the floor by its own forces in Greater New York, but outside that territory it will sell the material ready mixed for laying and will supply an experienced foreman to direct the work. Practically all the material for the composition is imported and will be mixed in the company's plant in Brooklyn.

Trade Catalogue Library.—A library has been established in the Hudson Terminals at 50 Church street, New York City, which is accepting catalogues of American manufacturers, classifying and filing these catalogues and digesting them in card index form for reference and consultation of buyers, manufacturers, engineers, contractors, purchasing agents and other consumers, both resident in and visitors to the metropolitan district. The plan has filled a needed want in the way of providing a permanent and comprehensive collection of trade literature, which is resulting to the mutual benefit of the manufacturer and the buyer.

The custodian of the library is the Commercial Bureau Company, to which applications for space should be addressed. The total cost to the manufacturer will be \$10 per year, for which sum he is entitled to have placed on file any or all of his catalogues, photographs, drawings, etc. This fee also includes the insertion in card index files for buyers, of a card giving a printed index of the original catalogues placed on file by the manufacturer. These card index files are distributed to buyers and others interested for use in their own offices.

Change of Office.—The general offices of the Universal Road Machinery Company have been removed from New York to Kingston, N. Y., where its shops are located. The office of the President, Mr. George H. Ford, will be kept at 120 Liberty street, New York.

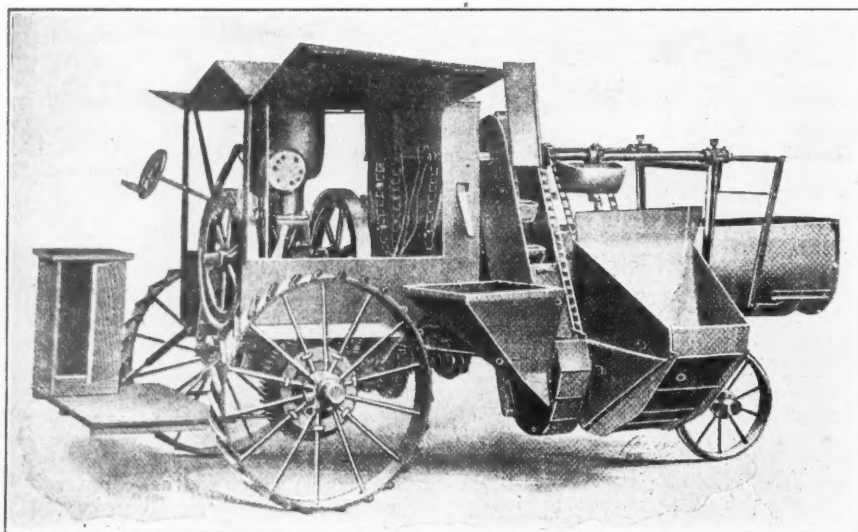
Menzies Street Cleaner.—The Menzies Street Cleaner Company, Glens Falls, N. Y., have issued a new catalogue, describing the Menzies Patented Sanitary Hand Cleaning Machine. The largest cities in the country have used them for years with entire satisfaction and the demand is rapidly increasing.

MUNICIPAL APPLIANCES

Continuous Concrete Mixer with Measuring and Elevating Devices

THE Butler Concrete Machinery Co., Butler, Ind., manufacture concrete mixers of several sizes and types. Their model AA mixer is shown in the illustration. The mixing apparatus is of the pug-mill type; three hoppers receive the cement, sand and stone and deliver it by bucket elevators which do the measuring into the trough. The whole is mounted on a four-wheeled truck, propelled by a gasoline engine which also does the mixing.

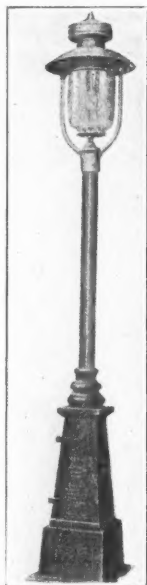
Capacity is from 150 to 200 cu. yd. per day with a 5-hp water-cooled Novo gasoline engine which is simple and compact and claimed to be reliable and easily operated. The main frame is constructed of 3 by 3½ by ¾ steel angle to which the various parts are securely bolted and braced. The front bolster and axle are of the swivel type, allowing perfect freedom of the front trucks. These are guided and held in place by chams running back to the shaft which in turn is connected by a worm gear to the steering wheel. The rear axle is of the best steel shafting, size 2 inches, with differential gears and wide bearings. All the gears are of the Web pattern and four sets of steel back gears are used, including the special design clutch for operating the traction. The wheels are 38 by 8 inches wide and the rear 20 by 6 inches. The gears are of the best gray iron and steel of such dimensions as to require a minimum amount of power to operate the machine. The pug shaft is of square steel, making it easy to remove or replace the mixing paddles. The drum is made of 10 gauge steel boiler plate, 7 ft. 2 in. long, with 36 steel mixing paddles. The sand, stone and cement hoppers are made of 14 and 16 gauge steel and are located at the side of the mixing drum, 27 inches high to the top of the hoppers, where the elevating buckets pass through a special made boot, picking up the materials in just such quantities as the size and number of buckets will admit and deposits it into the mixing drum in plain sight in the propositions desired by the arrangement of the buckets on the links or chain belt. The elevating chain and steel buckets are of standard pattern.



TWENTIETH CENTURY CONTINUOUS CONCRETE MIXER

Gasoline Street Lamp

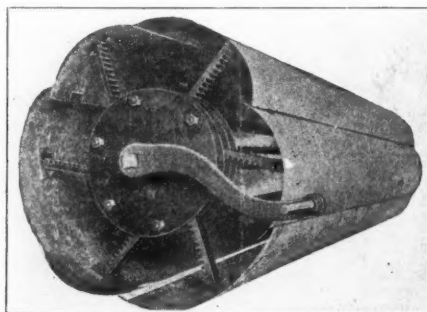
A GASOLINE street lamp of 1,000 candlepower, which is suited for lighting small town and suburban streets, is made by the Herz Manufacturing Company, of 388 Jackson street, St. Paul, Minn. The height of the lamp post, which is of cast iron, is 11 feet, the base is 2 feet square and the weight of the whole is 225 pounds. Each lamp is filled, as shown in the illustration, with a Herz Simplex generating tank, making each unit a gas machine in itself.



The base of the post is made larger than in the case of a gas or electric pole so that the door will provide free access to the apparatus. Although gasoline lighting is of special interest to towns desiring to light their streets for the first time, even the largest cities have not been able to dispense with the system in its suburban sections.

Adjustable Concrete Culvert Mold

A CONCRETE culvert mold having a simple mechanism for adjustment is made by the Township Supply Co., Garrison and Lawton avenues, St. Louis, Mo. The illustration shows the mold set for making a culvert 24 inches



ADJUSTABLE CONCRETE CULVERT MOLD

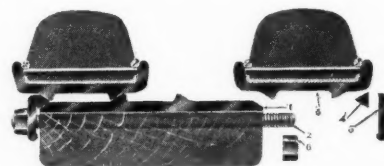
in diameter. The same mold makes all sizes, 14 to 24 inches, and any length required. A larger size molds culvert in all sizes from 30 inches to 5 feet in diameter. It is claimed that with these molds in many places concrete culverts can be built for less money than wooden ones.

The New Firestone Quick Removable Side-Wire Tires

A NEW tire and rim equipment that promises to revolutionize the present methods of changing truck tires has been placed on the market by the Firestone Tire & Rubber Company. This equipment does away with lay-ups for tire repairs or replacements by enabling the driver to change tires anywhere in a few minutes with no other tool than a wrench. It keeps deliveries going on with but slight interruption and cuts off the dead expense of having the vehicle out of commission on account of tires.



This illustrates a single tire mounted on the wheel.



The second cut shows sectional view of rear wheel equipped with dual tires, one of which has been removed. In order to change tires, the driver removes the nuts (No. 6), of which there are fourteen around the wheel. This releases the clamping flange (No. 5). He then slides off the tire, rim and all in one lateral movement. The clamping ring (No. 4) is split and comes off along with the tire. A spare tire already applied to rim is substituted by merely reversing the operation. One or two spare rims with tires already applied are kept at headquarters ready for use. Rims of equivalent size are interchangeable on all wheels, front and rear, single or dual.

There is no risk of the tire not being firmly and properly applied in its rim, for the tire itself is applied by experts at any of the hundred-odd Firestone applying stations. The driver only changes the rim and does not tamper with the tire itself.

This equipment enables the removal of any tires at will to be rebuilt or repaired before they are too far gone. Such repairs to Firestone side-wire tires frequently double their length of service.

Like all other Firestone products, this equipment has been thoroughly tested, and its efficiency proved in actual service before offering to the public. One of the largest truck manufacturers has already adopted it as regular equipment. Demonstrations are given at the Madison Square Garden and Chicago and Boston auto shows and literature sent on request to any one interested.

Contractor's Motor Truck

AN automobile truck with an end dumping body suitable for contractors' use has been placed on the market by the White Company, Cleveland, O. One of these trucks has been used in New York City for several months by McDonald and Barry for hauling coal, ashes and gravel. When working on ashes the truck carried them from a power house situated on the Harlem River at 224th street to a new street that was being filled at Broadway and 246th street.

The truck carries a load of seven cubic yards of ashes a distance of over a mile. In comparison with horses, the regular teams which have been used on this work have been hauling three and a half cubic yards to a load. The daily trips average from five to six. The truck has been carrying twice as great a load and has averaged from 10 to 12 trips, or double the number. In other words, it has easily done four times the work, or taken the place of four horse-drawn wagons.

The main points in the specifications of the G T A, as it is called, truck is as follows:

Cylinders—Four cylinders cast en bloc, dimensions, 3 $\frac{3}{4}$ -inch bore, 5 $\frac{1}{2}$ -inch stroke.

Motor Control—Throttle and spark advance controlled by levers mounted on steering wheel.

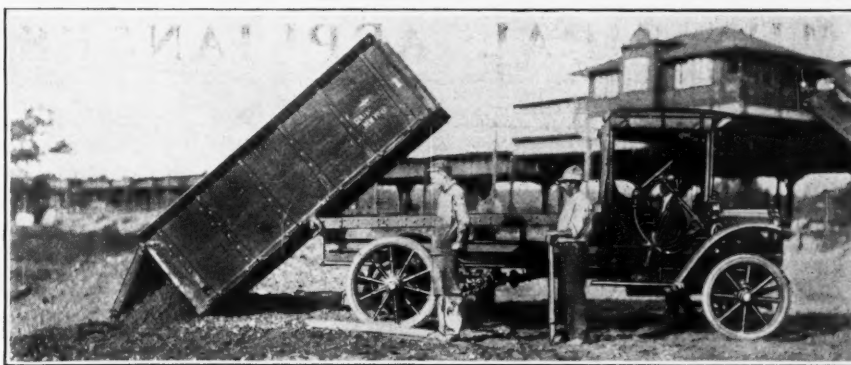
Transmission—Four forward speeds with direct drive in the third gear, and a reverse. The transmission is of the selected type. The gear shifting mechanism is enclosed within the gear case which forms an oil well and is free from dirt and grit. The gears are made of chrome nickel steel. All gear shafts are ball bearing.

Clutch—Leather faced, cone clutch.

Valves—Mechanically operated and interchangeable. Each valve with its valve-stem is a one-piece forging made of special nickel alloy of such a nature as to prevent distortion by heat. The valve lifters have fibre seats, thus reducing noise to a minimum and preventing the ingress of grit and sand.

Motor Cooling—Positive water circulation by gear-driven centrifugal pump. The radiator is so supported that it does not receive the strain to which the frame may be subjected on rough roads.

Lubrication—A combination of the splash system with positive speed.



3-TON END DUMPING CONTRACTOR'S TRUCK.

Ignition—Bosch magneto.

Carburetor—White, water-jacketed.

Crankcase—Made in two sections of special aluminum alloy. The upper section carries all the working parts of the motor. The lower section is simply an oil well and is easily removable for inspection or adjustment of connecting rods, camshaft, etc., without disturbing the crankshaft bearings.

Crankshaft—Forged of nickel steel. Is of unusually heavy construction.

Mechanism Protected—Mechanism incased in a heavy sheet metal dust pan. Universal joints protected in heavy leather shoe, which permits being packed in grease.

Steering—Worm and sector type with ball-thrust bearings.

Brakes—Internal, expanding, in rear; external, contracting brakes on the jackshaft. Very large.

Drive—Shaft drive from gearcase to jack shaft. This shaft is fitted with two universal joints. From jackshaft transmitted by a chain to rear wheels. Differential in jackshaft.

Frame—Standard "I" beam, six inches high.

Springs—Front springs semi-elliptic; rear springs platform type.

Front Axle—Solid drop forging, 40 carbon steel.

Rear Axle—Solid drop forging, 40 carbon steel, straight; springs hung from lower side.

Wheels—Steel casting reinforced by webs. Wheel Base—144 inches.

Tread—Front wheels (center to center of tires) 63 $\frac{3}{4}$ inches; rear wheels (center to center of tires) 65 $\frac{1}{2}$ inches.

Tires—36 x 5 inches, solid in front; 40 x 4 inches, solid double tires in rear.

Measurements—Length over all 19 feet 7 $\frac{1}{2}$ inches; dash to rear, 16 feet 10 $\frac{1}{2}$ inches; length of platform, 13 feet 3 inches; width of platform, 6 feet 5 inches.

Digging Ditches with Dynamite

THE excavation of trenches with dynamite is a process which is being exploited by the E. I. du Pont de Nemours Powder Company, of Wilmington, Del. While the process is specially adapted for use in wet clay and hence has been used mostly in the digging of drainage ditches, there are many instances in which the process would be available for municipal work. Outfall sewers, for example, in sea coast cities often run through areas of marshy land before discharging into the ocean.

Every one who has had anything to do with excavating in rock, shale or frozen earth, knows that this work cannot be done rapidly or economically without explosives. Very few people know, and they have only found it out quite recently, that ditches and channels through clay, gumbo, sand, loam or other earth can be dug at a wonderful speed and at a low cost with dynamite. Ditches and channels can be cut through swamps, although several inches or even a foot of water covers the ground, just as well as or even better than through dry ground. A channel or ditch dug with dynamite, and particularly one cut through dry or sandy ground is not so even and regular just at first as one dug by hand or machine, but will even up very soon after water fills it, and as the banks have a good slope there is little caving afterward.

When a ditch is blasted there is no outlay for expensive equipment because the only machinery necessary is an iron bar pointed at one end. In hard dry ground a sledge or maul is needed to drive the bar down to the necessary depth. There is no delay and expense getting machinery in place through swamps and thickets. Not even a team is needed when ditches are dug with dynamite, for one or two men can carry sufficient dynamite to dig a ditch four or five hundred feet long, four or five feet wide and three or four feet deep. When ditches are dug with dynamite, the material taken from the ditch is practically all thrown out by the blast and little shoveling is necessary.

Ohio Road Machine Abroad

THE accompanying photograph illustrates an Ohio reversible road machine in use in road making on the plantation of J. W. Bischodt, St. Thomas, Danish West Indies. The value of the machine is not limited to its use on roads. In fact, the machine illustrated has been used with great success in digging small canals from one part of the harbor to another. A number of types of grades are made by the Ohio Road Machinery Company, Oberlin, O.

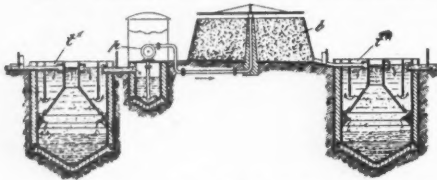


BUILDING ROAD IN WEST INDIES WITH OHIO REVERSIBLE ROAD GRADER.

PATENT CLAIMS

978,889. TREATING SEWAGE. Karl Imhoff, Bredene, near Essen, Germany. Serial No. 544,852.

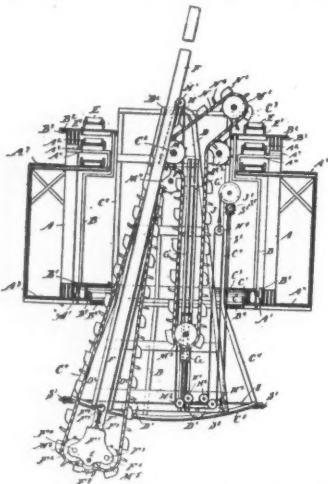
The method of treating sewage consisting in passing it through a sedimentation



tank, thence to a biological filter, thence to a further sedimentation tank and periodically changing the direction of movement so that each sedimentation tank is alternately employed as the first and final tank respectively.

978,908. EXCAVATING APPARATUS. William J. Leary, New York, N. Y., assignor to W. J. Leary Manufacturing Co., Jersey City, N. J., a Corporation of New Jersey. Serial No. 497,589.

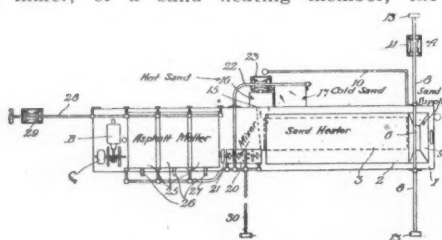
In an apparatus of the character set forth, a pair of girders disposed horizontally and parallel and provided with bottom stringers, a carriage supported by the bottom stringers only of said girders and mov-



able longitudinally thereof in the space between them, a turn table in said carriage, a boom having side bars, a conveyor of the chain and bucket type mounted on said boom, the buckets of which are movable between the side bars of said boom, cars movably supported on the turn table on said carriage, and a swinging frame in which said boom is mounted to slide, said frame being carried by and rotatable with said turn table.

978,973. ASPHALT-PAVING PLANT. Charles I. Williams, Utica, N. Y. Serial No. 383,128.

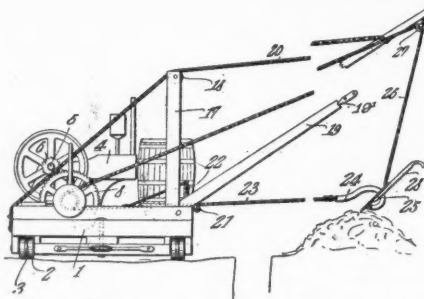
In a plant of the character described, the combination with an asphalt melter and a mixer, of a sand heating member, the



same comprising an automatic feeding supply, a receptacle for the heated output therefrom and a receptacle adjacent to the latter for cold sand, the two latter receptacles having outlets for discharge into a common receptacle whereby the sand may be mixed to supply the mixer with sand of desired temperature, substantially as described.

978,886. TRENCH-FILLING APPARATUS. William G. Howe, Butler, Ind. Serial No. 511,114.

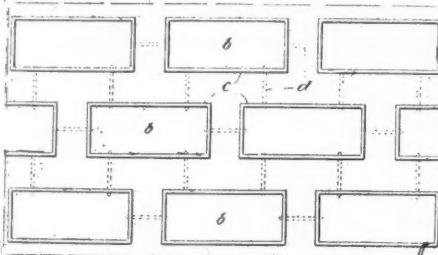
An apparatus as described comprising a wheel mounted platform, an engine located upon the platform, a shaft operatively connected with the engine, winding drums mounted upon the shaft, lever actuated clutch mechanisms mounted upon the shaft for engagement with the winding drums and being located between the adjacent



ends of the drums, a boom pivotally attached to the platform and restrained to swing in a vertical plane only between the adjacent ends of the drums, a cable arranged to wind upon each drum, one of said cables being guided along the boom and a guide for the other cable located upon the platform, a manually directible scraper with which both of said cables connect, a brace attached to the boom and pivotally connected with the platform, said cable guide being located upon the platform at a point between the end of the said brace and the end of the said boom.

978,994. PAVEMENT. Matthew E. Dunn, New York, N. Y. Serial No. 459,522.

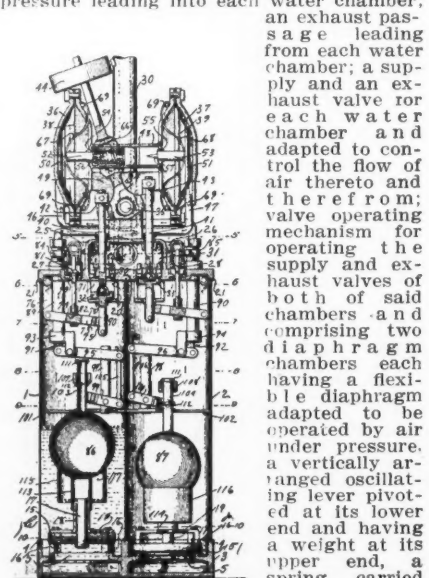
A continuous street pavement having a foundation, a number of metallic reinforce sections placed on edge on the foundation and spaced from each other, said reinforce sections having openings in the walls thereof, metallic ties extending between the adjacent walls of adjacent reinforce



sections and provided at their ends with heads, said ends projecting through said openings and said heads being adapted to contact with the inner surfaces of said sections to prevent separation thereof and being removable through said openings, thereby joining the reinforce sections together and permitting any one of them to be removed without disturbing the others, and a sheet of paving material laid on the foundation and between the reinforce sections.

979,107. DEVICE FOR RAISING WATER. John M. Swanstrom, Chicago, Ill. Serial No. 519,397.

In a device of the class described, two water chambers; a valve controlled inlet passage for each chamber and through which water may enter thereinto; a valve controlled outlet passage for each chamber and through which water is discharged therefrom; a supply passage for air under pressure leading into each water chamber;

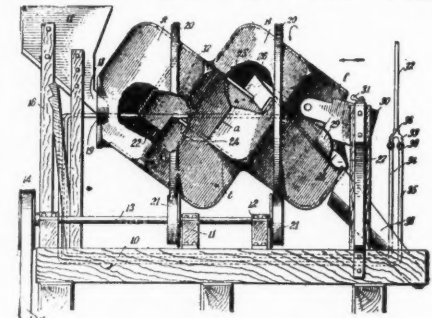


which movements of said diaphragm are

communicated to said lever, and means whereby movement of said lever is transmitted to said supply and exhaust valves; a conduit leading from within each water chamber and adapted to conduct air under pressure from the interior of the chamber from which it leads to one of said diaphragm chambers and which conduits constitute the sole connecting means through which fluid may flow with which said chambers are provided; a valve for each of said conduits and adapted to control the flow of air therethrough; a float within each water chamber; and lever mechanism interposed between each of said floats and one of said controlling valves and through which said valve is operated.

977,897. MIXING MACHINE. Alvin Flavel Nims, Philadelphia, N. Y. Serial No. 545,813.

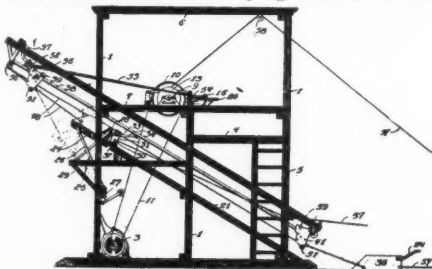
A mixing machine, comprising hollow sections communicating interiorly, and rotatably mounted, one of said sections having an inlet, the other of said sections having



an outlet, a partition in the first of said sections, having a part cut away and extending across said section, the first of said sections having a wall thereof extending into the second of said sections to form a partition within said second section.

977,920. EXCAVATING MACHINE. Vernon A. Younger, San Jose, Cal., assignor to Joshua M. Younger, San Jose, Cal. Serial No. 516,169.

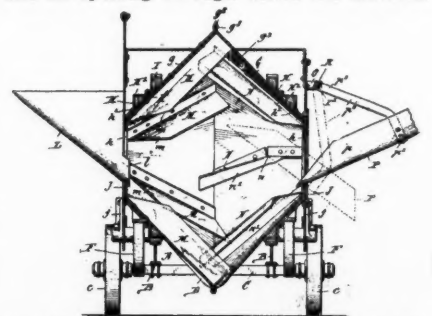
A device of the character described comprising a slideway, raising and lowering drums carried by said slideway, separate cables for each drum, shovels connected to said cables, shovel dumping means at one



end of said slideway, tracks carried by said slideway, a carrier mounted on each track, and means carried by the cables of the hoisting drums for causing said carriers to render the hoisting drums idle and the lowering drums active after the shovels have been dumped.

978,011. MIXING MACHINE. Charles E. Foote and Chester T. Foote, Nunda, N. Y., assignors to The Foote Manufacturing Company, a firm consisting of Charles S. Warner, Wilson H. Willard, Oscar J. Willard, Charles E. Foote, Fred G. Olp and Chester T. Foote, Nunda, N. Y. Serial No. 389,551.

In a mixing machine, a tapering mixing drum having mixing-wings and discharge-wings secured to the inner sides of its walls and an opening through which the material



is discharged, said discharge-wings having their free longitudinal edges bent at an angle to form scoops, and at least one of said discharge-wings bent rearward at a point between its ends.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Bridges and Concrete Work—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREET IMPROVEMENTS				
Kansas.....	Hutchinson.....	Jan. 6.....	Improv. 6 mi. of road including laying of 8,000 cu. yds. of clay or gumbo, excav. 5,000 cu. yds. of earth & build 6 culverts.	H. R. Hamma, County Clerk.
Ohio.....	Cincinnati.....	Jan. 6, noon.....	Imp. Dick road from Howard's Crk. to Oxford road, Crosby twp.	Fred Dreihls, Clk., County Comrs.
Connecticut.....	New Haven.....	Jan. 6.....	Furn. crushed stone dur. 1911, inc. 8,000 tons screenings.	C. W. Kelly, City Engineer.
Georgia.....	Savannah.....	Jan. 6.....	Furn. 4,000 cu. yds. cement gravel for improving and repaving roads.	A. B. Moore, Chm. County Comrs.
Indiana.....	Frankfort.....	Jan. 7, 2 p.m.....	Constructing 4 gravel roads.....	Charles F. Cromwell, County Aud.
New Jersey.....	Jersey City.....	Jan. 9, 2 p.m.....	Belgian block paving 1,400 sq. yds., 1,150 cu. yds. earth excav. and 250 cu. yds. earth and 340 cu. yds. sand fill; 3,500 sq. feet flag.	Geo. T. Bouton, Clk. St. & W. Bd.
Kansas.....	Oskaloosa.....	Jan. 9, 10 a.m.....	Grad. and macadamizing portions of James Neal et al. roads.	Geo. A. Patterson, Chm. Co. Comrs.
Pennsylvania.....	Erie.....	Jan. 9, 8 p.m.....	Paving 26th st. from Peach to Chestnut st.	B. E. Briggs, City Engineer.
New York.....	Albany.....	Jan. 9, 1 p.m.....	Improving 23 State highways in 12 different Counties, ranging from 1.21 to 8.58 mi. long, total length, 99.65 miles.	S. P. Hooker, Chm. State Hwy. Comn.
Missouri.....	St. Louis.....	Jan. 10.....	Constructing a municipal asphalt plant.	W. B. Dryden, Secy. B.I. Pub. Imp.
Nebraska.....	Geneva.....	Jan. 10, noon.....	Grad. and build bridges in Fillmore County during 1911.	Uriah F. Stanard, County Clerk.
Nebraska.....	Plattsmouth.....	Jan. 10, noon.....	Grad. County roads; plans with D. C. Morgan, County Clerk.	County Judge of Cass County.
Florida.....	Palatka.....	Jan. 10, noon.....	Grad. and paving 5,071 sq. yds., curbing 3,837 lin. ft.	E. S. Crill, Chm. Bd. Bond Trustees.
Texas.....	Wichita Falls.....	Jan. 11.....	Pav. business dist. of city with various kinds of material.	Mayor and City Council.
New York.....	Albany.....	Jan. 11, 1 p.m.....	Improving 24 State highways in 9 different Counties, ranging from 0.50 to 6.22 miles long, total length, 84.19 miles.	S. P. Hooker, Chm. State Hwy. Com.
New Jersey.....	Salem.....	Jan. 11.....	Grad. and plac. grav. and oyster shell surface, 5.05 mi. Wdstwn.	H. P. Gray, Dir. Bd. Freeholders.
Indiana.....	Rushville.....	Jan. 11, 2 p.m.....	Bldg. mac. rd. in Anderson twp., pet. for by J. A. Brown et al.	Jesse M. Stone, County Auditor.
California.....	Chico.....	Jan. 12, 7:30 p.m.....	Grading and graveling 39 sections of streets; price per cu. yd.	B. F. Hudspeth, City Clerk.
New York.....	Albany.....	Jan. 13, 1 p.m.....	Improving 20 State highways in 13 different Counties, ranging from 0.53 to 7.04 miles long, total length aggregating 84.29 mi.	S. P. Hooker, Chm. State Hwy. Com.
Minnesota.....	Minneapolis.....	Jan. 13, 7:30 p.m.....	Furn. paving material during 1911, inc. sandstone, creo. wood and vit. paving block; granite and sandstone curb, crushed granite, cement.	Henry N. Knott, City Clerk.
California.....	Los Angeles.....	Jan. 16, 2 p.m.....	Improving portions of Huntington Drive in Los Angeles County	C. G. Keyes, County Clerk.
Kentucky.....	Paducah.....	Jan. 16, 3 p.m.....	Bldg. sidewalks, etc., 3 jobs: concrete walks: 14,325, 23,000 and 13,300 sq. ft.; concrete driveways: 820, 800 and 380 sq. ft.; concrete gutters: 2,900, 3,946 and 2,520 lin. ft.; granite curb: 2,900, 3,940 and 2,500 lin. ft.; L. A. Washington, City Engineer.	Board of Public Works.
Ohio.....	Lakewood.....	Jan. 16, noon.....	Paving 3 aves. and one road; Wm. H. Evers Eng. Co., Arc. Clvid	B. M. Cook, Village Clerk.
Oregon.....	Salem.....	Jan. 16.....	Paving 175,000 sq. yds. street surface with hard surface pave.	F. W. Raymond, City Auditor.
Washington.....	Olympia.....	Jan. 18.....	Grad. drain, mac. etc., State Aid rd. 99, Walla Walla Co.	W. A. Morse, City Recorder.
New Jersey.....	Mt. Holly.....	Jan. 19, 11 a.m.....	Grav. rd. through Akron from Gardner's Cor. to Atlantic Co. line	H. L. Bowlby, Sec'y. St. Hwy. Bd.
Ohio.....	Hamilton.....	Jan. 20 noon.....	Imp. Dayton Pike Sycamore twp., Spec. No. 127; Bond \$1,000.	Earl Thomson, Co. Engr., Camden.
New Jersey.....	Alpine.....	Jan. 21.....	Bldg. stone rd. 2,570 ft. long, from Tenaftly to Alpine, Sylvan av.	Fred Dreihls, Clk. County Comrs.
Alabama.....	Wetumpka.....	Jan. 23.....	Road improvements to cost \$170,000.	Franklin W. Hopkins, Mayor.
				Solomon Norcross, C.E., Atlanta, Ga
SEWERAGE				
Wyoming.....	Buffalo.....	Jan. 6, 8 p.m.....	Bldg. sewer system: 6,390 ft., 6-in.; 11,540 ft., 8-in.; 1910 ft., 10-in.; 4,340 ft., 12-in. and 700 ft., 15-in. pipe sewer, 51 manholes, 15 flush tanks; 22 lamp holes, house con., outlets, etc.	E. L. Clarke, Engineer-in-Charge.
California.....	Oroville.....	Jan. 7.....	Bldg. sewer system, as whole or labor and material separately; Olmsted & Gillen, 604 Wright & Callender Building, Los Angeles, Engineers.	C. H. Reed, Jr., City Clerk.
South Dakota.....	Aberdeen.....	Jan. 9.....	Bldg. 5,600 ft. 12, 15 and 20-in. pipe sewer ext., 14 manholes.	F. W. Raymond, City Auditor.
Minnesota.....	Springfield.....	Jan. 9, 8 p.m.....	Bldg. 8-in. sewer on Brun st.	J. A. Eichmann, Village Recorder.
California.....	Brawley.....	Jan. 12.....	Bldg. sewer mains, outfall sewer and septic tank.	W. H. Wheelan, City Clerk.
Minnesota.....	Minneapolis.....	Jan. 13, 7:30 p.m.....	Furn. Portland cement for sewer and street work, etc., in 1911.	N. K. Thompson, Street Comr.
New Jersey.....	Elizabeth.....	Jan. 16, 8:30 p.m.....	Furn. and lay 570 ft. 10-in., 505 ft. 8-in., sewer, m.h., etc.	W. W. Southard, City Engineer.
Oklahoma.....	Checotah.....	Jan. 16.....	Bldg. 11 miles 8, 10 and 12-in. san. sewer, disposal works, etc.	L. A. Washington, City Engineer.
Kentucky.....	Paducah.....	Jan. 16, 3:30 p.m.....	Constructing c.i. drain pipes, paving, etc., 2 sts.	C. V. Cloud, Chm. Council Com.-in-C.
Pennsylvania.....	Masontown.....	Jan. 16.....	Constructing a sewer and water system for borough.	G. D. Holmes, Ch. Engr. Inter. S. Bd.
New York.....	Syracuse.....	Jan. 26 10 a.m.....	Bldg. Harbor brook intercepting sewer and imp. stream.	C. R. Heath, Health Engineer.
Manitoba, Can.....	Souris.....	Feb. 1.....	Furn. 31,000 ft. vit. sewer pipe, etc. spring and summer, 1911.	
WATER SUPPLY				
New Jersey.....	Newark.....	Jan. 6, 3 p.m.....	Furn. and lay. water pipes and con. at Tuberc. Hosp. at Soho.	L. E. Voorhees, Chm. Com. Bd. Fr'h.
Nebraska.....	Superior.....	Jan. 6, 8 p.m.....	Bldg. extensions and additions to water works system.	J. T. Robbins, City Clerk.
Washington.....	Spokane.....	Jan. 6, 2 p.m.....	Furn. 3,600 ft. 18-in. water pipe to withstand working pressure of 125 lbs. per sq. in.; bidders' spec. and 3 copies of bids.	John Gifford, City Purchasing Agt.
Iowa.....	Newton.....	Jan. 9, 7:30 p.m.....	Bldg. 100,000 gal. steel water tank on 100-ft. steel trestle.	E. G. Finch, City Clerk.
Ohio.....	Euclid.....	Jan. 9, noon.....	Construc. 6-in. water mains in 3 sts., F. A. Pease Eng., Cleveid.	Nelson J. Brewer, Village Clerk.
Illinois.....	Anna.....	Jan. 9.....	Constructing a \$50,000 water works system.	Mayor and City Council.
Kansas.....	Onaga.....	Jan. 10, 7 p.m.....	Bldg. w. w. system; Burns & McDonnell, Scaritt bldg., K. C. Mo.	Elmer E. Hines, City Clerk.
Maryland.....	Ft. Smallwood.....	Jan. 10.....	Bldg. pump house and install. pump. machinery at Fort.	Constr. Q. M., U.S. Army, Ft. Howard
Oregon.....	Portland.....	Jan. 10, 4 p.m.....	Furn. c.i. pipe, etc.; 700 lengths, 30-in., 1,303 tons; 1,000 lengths, 12-in., 485 tons; 300 lengths 10-in., 114 tons; 10,000 lengths 8-in., 2,575 tons; 1,000 lengths 6-in., 190 tons; total 5,792 tons; also 100,000 lbs. specials, all del. f.o.b. cars Albina Yard, Portland.	D. D. Clarke, Engr., Water Bd.
South Dakota.....	Onida.....	Jan. 11.....	Bldg. w. w. system; plans by Des Moines Bldg. & Iron Co., D. M.	E. E. Brookings, Town Clerk.
New York.....	Angola.....	Jan. 11, 8 p.m.....	Bldg. w. w. system; 850 tons (7.25 mi.) c.i. pipe, 50 fire hydrants 38 valves and boxes, pumping station, inc. well, etc., 2 power pumps, 2 gas engines, steel standpipe, etc. furn. any or all, or for entire job, Witmer & Brown, Chapin Bldg., Buffalo, Eng.	George L. Peck, Clk. Village Trus.
Washington.....	Spokane.....	Jan. 13, 2 p.m.....	Bids in triplicate for 100 4-in. and 30 6-in. hydrants; 50 6-in., 25 8-in. 25 10-in. and 25 12-in. valves, c.i. bell and 50 6-in. valves, Kal. bell.	John Gifford, City Purchasing Agt.
Kentucky.....	Dayton.....	Jan. 16.....	Franchise to construct and operate w. w. system for 18 years.	C. V. Cloud, Chm. Council Com.
Pennsylvania.....	Masontown.....	Jan. 16.....	Constructing a water and sewer system for Borough.	

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
WATER SUPPLY (Continued)				
Michigan.....	Grand Rapids...	Jan. 19, 8 p.m.	Bldg. fireproof w.w. and filtration plant, one story, 178x178 ft., and repair shop, two stories, 40x66 ft.; cost \$400,000; Hering & Fuller, Engrs. 170 Broadway, New York City.....	S. A. Freshney, Gen. Mgr., Bd. P. W.
Missouri.....	Kansas City.....	Jan. 26.....	Bldg. horizontal shaft centrifugal pump, direct connected to vertical cross-com. engine, capacity 30,000,000 gals.....	W. Kiersted, Ch. Engr. Water Dept.
Manitoba, Can.	Souris.....	Feb. 1.....	Furn. 425 ton; c.i. water pipe, specials, fire hydrants, gate valves and boxes, pig lead, etc., in spring and summer of 1911.....	J. W. Breakey, Secy.-Treasurer.
BRIDGES				
South Dakota..	Wessington Spgs.	Jan. 7.....	Furn. material and bldg. 8 comb. steel and concrete bridges....	Board of County Commissioners.
Illinois.....	East St. Louis...	Jan. 9.....	Bldg. 4 steel hwy. bridges, each 270 ft. long, cost \$45,000.....	H. D. Sexton, Pres. Sanitary Dist.
Ohio.....	Girard.....	Jan. 9.....	Conc. work and bridge construction, new road to Mosier Lane..	Trumbull County Commissioners.
New York.....	New York.....	Jan. 10, 2 p.m.	Bldg. elevator, stairs, drainage, ornamental work and elec. work for anchor piers of Queensboro Bridge over East river..	Kingsley L. Martin, Bridge Comr.
Nebraska.....	Geneva.....	Jan. 10, noon.....	Constructing bridge fills and grading in County during 1911..	Uriah F. Stanard, County Auditor.
Nebraska.....	York.....	Jan. 10.....	Erec. all steel and wood. bridges ordered dur. 1911 by York Co.	H. F. Chapin, County Clerk.
Kansas.....	Newton.....	Jan. 10, noon.....	Erecting three iron and concrete bridges.....	J. A. Hunter, County Clerk.
Quebec, Can.	Quebec.....	Jan. 11.....	Construct. a bridge and appro. over the St. Charles river.....	W. D. Baillairge.
Ohio.....	Cincinnati.....	Jan. 13, noon.....	Bldg. concrete bridge on Cooper ave.....	Fred Dreihls, Clk. Co. Comrs.
Kansas.....	Wichita.....	Jan. 16.....	Bldg. pile bridge in Lincoln twp.....	Jesse Leland, County Clerk.
Virginia.....	Richmond.....	Feb. 1, 4 p.m.	Plans, designs, detailed drawings, strainsheets, specifications and proposals for \$225,000 rein. concrete bridge over James ri.	Charles E. Bolling, City Engineer.
LIGHTING AND POWER				
Minnesota.....	Shakopee.....	Jan. 10.....	Furn. and install engine driven pump in power house.....	Supt. Electric Lighting Plant.
Minnesota.....	Duluth.....	Jan. 12, 4 p.m.	Furn. a gas exhaust f.o.b. Duluth.....	L. N. Case, Mgr. Water & Lt. Comrs
Ohio.....	Columbus.....	Jan. 13, 9 a.m.	Elec. wiring and heating plant for Ohio Penitentiary.....	Marriott & Allen, Architects.
New Jersey.....	Perth Amboy.....	Jan. 15.....	Structural iron work on 200x200 ft., power house, 50 ft. high..	Public Service Electric Company.
FIRE EQUIPMENT				
Missouri.....	St. Louis.....	Jan. 6.....	Building engine house.....	Board Public Improvement.
Washington.....	Tacoma.....	Jan. 16, 3 p.m.	Furn. motor-driven comb. chemical engine and hose wagon; one motor-driven Aerial ladder truck; also auto roadster to carry four persons.....	L. W. Roys, Comr. Pub. Safety.
MISCELLANEOUS				
Maryland.....	Cumberland.....	Jan. 7, noon.....	Bldg. City Hall.....	Ward M. Eichelberger, Comr. P. P.
Ohio.....	E. Youngstown...	Jan. 8.....	Erect. a stone, brick and frame City Bldg.; A. P. Thompson, Arch.	P. J. Carney, Jr., Village Clerk.
Wisconsin.....	Whitehall.....	Jan. 10, 2 p.m.	Bldg. brick and stone addi. to Court house & jail, cell work, etc.	Jas. N. Hunter, Chm., C. H. Com.
New York.....	N. Brighton, S.I.	Jan. 10.....	Bldg. furnaces, steam boilers, etc., of Clifton destructor.....	Geo. Cromwell, Boro. President.
Virginia.....	Norfolk.....	Jan. 10, 12:30 p.m.	Erecting Police Headquarters, 1st. Precinct Station and Police Court; \$2,000 certified check with bid; \$25 for plans: John Kevan Peebles, Archt.....	Board of Control of Norfolk City.
California.....	Oakland.....	Jan. 11, 11 a.m.	Dredging and filling in the Key Route Basin; \$50,000 security..	Jas. W. Nelson, Sec'y. Bd. Pub. Wks.
Canada.....	Ottawa, Ont.....	Jan. 11, 4 p.m.	Bldg. 15-in. suction dredge; also bldg. wharf.....	R. C. Des Rochers, Sec'y. Bd. P. Wk.
Minnesota.....	Minneapolis.....	Jan. 13, 7:30 p.m.	Furn. Portland cement for filter plant, st. and sew. work in 1911	Henry N. Knott, City Clerk
Louisiana.....	Lake Charles.....	Jan. 16.....	Erect. \$165,000 Court House, Payrot & Livaudais, Archts., New Orleans.....	Police Jury.
Pennsylvania...	Pottsville.....	Jan. 17, noon.....	Gen. contract for erect. bldg. for insane at Schuylkill Haven..	Charles T. Straughn, County Cont.
Pennsylvania...	Philadelphia.....	Jan. 20.....	Bldg. superstruc. of Vine st. pier; cost about \$35,000.....	J. F. Hasslari, Act. D. Dt. W. & D.
North Dakota..	La Moure.....	Jan. 20, 2 p.m.	Furnishing cor. galvanized culverts needed during 1911.....	C. J. Alister, County Auditor.
Minnesota.....	Minneapolis.....	Jan. 21, noon.....	Dredging in Lake Calhoun and filling low lands and boulevard adjacent; 500,000 cu. yds. material to be moved; \$1,000 check with bid.....	J. A. Ridgway, Secy. Bd. Pk. Comrs
Oklahoma.....	Ardmore.....	Jan. 23, noon.....	All furniture to furnish and equip new County Court House....	R. F. Scivally, Chm. Bd. County Co

STREET IMPROVEMENTS

Phoenix, Ariz.—Work will soon begin on proposed paving.

Santa Monica, Cal.—City will make following street improvements: Paving of 7th st. from California ave. N. to San Vicente blvd. in Palisades, estimated by City Engineer James at \$24,000; Fremont ave. will be opened for distance of 14,100 ft. at an estimated expense of \$14,879. Central ave. for 570 ft. and South 8th st. for 386 ft.

Sonoma, Cal.—City Trustees are considering purchase of municipal rock crusher.

Colorado Springs, Col.—Plans have been completed for parking six avenues at cost of \$250,000.—T. W. Waggener, City Engineer.

Brooksville, Fla.—Citizens will vote Jan. 17 on \$7,000 bonds for street improvements.

Manatee, Fla.—Council has ordered construction of sidewalks on cross streets.

St. Augustine, Fla.—Bids have been rejected for paving Orange st.; committee has been appointed to take up matter of paving Bay st.

Atlanta, Ga.—City Engineer R. M. Clayton estimated cost of repaving Spring st. at \$200,000.

Belleville, Ill.—City will pave number of streets at cost of \$70,730.

Peoria, Ill.—Council has decided to pave South st.

Rockford, Ill.—City is planning to macadamize 13 miles of streets.

Silvis, Ill.—Board of Trustees has decided to pave 1st ave. from 1st to 16th st.; cost \$60,000.

Indianapolis, Ind.—Board of Park Commissioners has passed resolutions for construction of a boulevard along Pleasant Run, from Beecher st. to Shelby st.; cost is \$80,000.—H. W. Klausmann, City Engineer.

Maquoketa, Ia.—City is planning paving of 20 more blocks next spring.

Sioux City, Ia.—Department of Streets is considering paving of 8th st., Jennings to Jackson, with concrete.

Hutchinson, Kan.—County Commissioners are considering construction of road in western part of Valley Township.

Kincaid, Kan.—Rock road will be built from this city east 4 miles to county line.

Topeka, Kan.—City Commissioners have decided to pave portions of 14th, Huntoon, Polk, 12th, and Chandler sts. with brick; 13th, Muirvane and King sts with asphaltic concrete.

Colfax, La.—Grant Parish is considering 15 to 20 miles of road.

New Orleans, La.—City is considering paving portion of Orleans st. with mineral rubber.

Baltimore, Md.—Harbor Board will consider three sets of tentative plans for construction of proposed water front street on south side of harbor as submitted by Harbor Engineer Lackey.

Boston, Mass.—Massachusetts Highway Commission, Harold Parker, Chairman, is planning to expend \$500,000 for new roads.

Springfield, Mass.—Board of Public Works is planning to construct street from corner of Mill st. and Belmont ave. south of Mill River to Dickinson st.; cost \$21,000.

Detroit, Mich.—Department of Public Works will secure bids for paving alley with vit. brick at cost of \$6,500.—J. J. Haarer, Commissioner.

Grand Rapids, Mich.—Council has voted to issue \$55,000 street improvement bonds.

L'Anse, Mich.—Citizens will vote on \$25,000 bonds to build road from Herman to Nestoria.

Glenwood, Minn.—Council is considering plans for large amount of paving; heavy concrete favored.

St. Cloud, Minn.—City Engineer S. S. Chute has completed plans for paving of the St. Germain st. bridge; \$7,500 available; plans call for four lines of 40-lb. I-beams, and old wooden stringers at present under bridge will be used for strengthening the beams.

Aberdeen, Miss.—City will not let contracts for paving until spring; cost, \$50,000; \$50,000 will also be expended to construct

road leading into Aberdeen.—J. M. Acker, Mayor.

Jefferson City, Mo.—City is considering building of eight blocks of macadam paving in spring.—E. F. C. Harding, City Engineer.

St. Joseph, Mo.—Board of Public Works is considering improvement of 5th st. and Shady ave.—Alfred Meier, President.

St. Louis, Mo.—City has passed ordinance for paving 18th and 19th sts.

Fremont, Neb.—City is considering paving of H st.

Brown's Mills, N. J.—Maps, plans and specifications for portion of the Brown's Mills and Lakehurst gravel road to be constructed by Pemberton Township are being considered by State Road Commissioner Fred. Gilkyson, of Trenton.

New Brunswick, N. J.—Residents of Piscataway Township have asked for macadamizing of portion of road from Main st., near Bound Brook to Cedar Lane, Piscataway.

Albuquerque, N. M.—City is considering paving of number of business streets with bitulithic.—F. H. Lester, Mayor.

Frankfort, N. Y.—Taxpayers are considering paving of Main st.—Richard Rose, President of Village.

Scotia, N. Y.—Board of Trustees has decided to pave Scotia dyke and portion of Mohawk ave.

Yonkers, N. Y.—City Engineer Cooper will draft plans for widening Warburton ave.

Raleigh, N. C.—Wake County is considering \$300,000 bond issue for road building.

Bucyrus, O.—City has sold \$25,000 street improvement bonds to City Bank.

Canton, O.—Council has adopted resolutions for improvement of McKinley and Arlington sts.; cost of improving Sharb st. has been estimated at \$23,693; Bellevue ave., at \$6,211; Dewalt st., at \$575; 4th st., at \$5,362; and 10th st., at \$10,360.—B. H. Weber, City Engineer.

Cincinnati, O.—Approximate estimates submitted to Director Sundmaker by Engineer Shipley are: Depot st., 8th to Gest,

with granite, \$17,903.50; Seegar alley, with granitoid, \$1,259; Harlem pl., with brick, \$14,691.50.

Cincinnati, O.—Council has approved resolution to improve Linn st. with wood block between car tracks.

Cincinnati, O.—Council Committee on Streets has recommended paving of Summers st.

East Liverpool, O.—Council has passed ordinance providing for improvement of Bradshaw ave. by grading and paving; also paving of St. George st.

Hamilton, O.—Butler County Commissioners will soon receive bids for construction of lower river road.—L. A. Dillon, County Engineer.

Massillon, O.—Council is considering advisability of repaving East Main st., Mill st. to Erie st., and paving of Duncan, Erie, Mill and Cherry sts.

Tiffin, O.—Macadamizing Miami and Will st. is being urged.—Charles J. Peters, City Engineer; Edward Kuhn, Superintendent Paving.

Portland, Ore.—Milwaukee, a suburb, has voted to improve principal streets at cost of \$60,000.

Butler, Pa.—Residents of Clinton Township, this county, and of Allegheny County are urging improved highway from Allegheny County line to Millerstown road, the road passing Lardin's Mills.

Norristown, Pa.—Springfield Township, Montgomery County, will have \$20,000 available for construction of roads.

Philadelphia, Pa.—Department of Public Works has postponed opening of bids for repairs to asphalt streets.

Kingston, Tenn.—Roane County is considering \$300,000 bond issue for good roads.

Nashville, Tenn.—City will soon begin construction of proposed Capitol Blvd., to extend from Church st. to Capitol grounds; cost, \$12,000.—W. W. Southgate, City Engineer.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$300,000 bonds for streets.

Greenville, Tex.—City will soon begin paving about 10 miles of streets; \$100,000 bond issue has been authorized.

Lufkin, Tex.—City has decided to pave sidewalks.

Seguin, Tex.—City will rebuild principal streets.

Suffolk, Va.—Nansemond County Board of Supervisors is considering \$8,000 expenditure on permanent road improvements.

Seattle, Wash.—Board of Public Works has approved plans for paving Western ave.

Spokane, Wash.—Board of Public Works has rejected bid of the Spokane Asphalt Macadam Paving Co., only one received on paving of Wall st., Garland ave. to north city limits; new bids will be sought.—Morton Macartney, City Engineer.

Waitsburg, Wash.—Paving of Main st. is being urged.

CONTRACTS AWARDED

Los Angeles, Cal.—By Board of Public Works, to Barber Asphalt Paving Co., Central Bldg., for improving Pasadena ave. and other streets, 16.08c. per sq. ft. for asphalt paving, 25.09c. per sq. ft. for brick paving, 25.09c. per sq. ft. for vit. brick gutters, 30c. per lin. ft. for cement or asphalt curb paving, \$1.10 per lin. ft. for curb with angle iron facing, \$510.19 for steel concrete culvert at Ave. 19, \$260.63 for vit. pipe culvert at Ave. 23, \$209.55 for same at Ave. 31, \$5,407 for storm sewer in Pasadena ave. and Ave. 37, \$3,168 for same in Pasadena ave. and Woodside Drive, \$2,414 for culvert and sewer in Arroyo del Cal, and \$669.87 for storm sewer in Pasadena ave. and Ave. 26; to B. C. Nichols for improving Hartford ave., (a) 25c. per sq. ft. for asphalt paving, (b) \$2.85 per lin. ft. for grading and graveling, (c) 35c. per lin. ft. for cement curb, 15c. per sq. ft. for cement gutter, 35c. per sq. ft. for vit. block gutter; other bidders: John Balch, (a) 32c., (b) 11½c., (c) no bid; David Joy, (a) 35c., (b) 12c., (c) 35c.; P. Heim, (a) 35c., (b) 12½c., (c) \$1.50.

St. Augustine, Fla.—Furnishing street grader to Good Roads Machine Co., Kennett Square, Philadelphia, Pa.

Chicago, Ill.—Building cinder sidewalks, to following bidders: Quinn Construction Co., 3519 W. Chicago ave.; John Hickey, 1402 W. 59th st.; Demling & Wendt, 84 La Salle st.; Siervert Colleen Co., 3865 Milwaukee ave.; Chas. Chambers & Son, 5248 S. Wood st., and Benjamin Sullivan, 7020 Rhodes ave.

Normal, Ill.—Paving Virginia ave. with brick, to Roy Williams, \$6,880.26.

Sioux City, Ia.—Paving 6th, 7th, 8th, 9th, 10th, 11th, 12th and 14th sts., between Pearl and Jackson sts., to Flinn & Hanlon, \$1.18 per sq. yd. for concrete and \$1.23 per sq. yd. for corrugated concrete; total, \$36,000.

Carrollton, Mo.—Vit. brick paving, 7,500 yds., to J. C. Likes, Des Moines, Ia., about \$10,000.—Brooks & Jacoby, Plunkert Bldg., Kansas City, Mo., Engineers.

Mt. Pleasant, N. Y.—Improving Columbus and Commerce aves., to Molls and Murray, Yonkers, \$45,000.

St. George, S. I., N. Y.—By George Cromwell, President, for furnishing all the labor and materials required for one 15-gross-ton steam roller, with equipment, to the Buffalo Steam Roller Co., 150 Nassau st., New York.

Wilmington, N. C.—To Bowe & Page, Charleston, S. C., to pave 3570 sq. yds. of street with cement gravel, 69½c. per sq. yd.; contract for 693 sq. yds. will be awarded later.—C. R. Humphreys, Engineer.

Akron, O.—Paving three sections of road between Cuyahoga Falls and the Cuyahoga County line: Section 3, to Wildes & Davidson, \$38,682.64; Section 1, to E. McShaffrey & Son, \$63,267.04; Section 5, to Paul & Henry, \$106,652.18.

Washington, Pa.—County road improvements: Macadamizing Monongahela pipe, section No. 3, to Neelan & Daily, S. 21st and Sidney sts., Pittsburgh, \$21,422.75, and Monongahela pike, section No. 4, to Donora Construction Co., \$11,859.40; brick: Roscoe-Stockdale road, to Hastings Piper, \$2,553.44; brick will be furnished by Pittsburgh-Buffalo Co., \$17.50 per M.; Meadowlands-Houston road, to Hallam Construction Co., city, \$31,980.48; brick will be furnished by four different firms, Pittsburgh-Buffalo Co., Donley Brick Co., James M. Porter, Toronto block, and James M. Porter, American sewer pipe Porter block; each furnishes fourth of the bricks at \$15 per M, except Donley Brick Co., which furnishes red clay brick at \$12.50 per M.

Denison, Tex.—To Roberts & McSpadden, Vinita, Okla., for completion of the \$250,000 road contract in Denison precinct; contract was abandoned by original contractor, Denis McNeerney, of Muskogee, Okla., after work to the extent of \$10,000 had been done.

Martindale, Tex.—By Precinct No. 2 of Caldwell County, to Van B. Flowers, Lockhart, at \$1,500 per mile to construct 3½ miles of gravel road; \$25,000.

BIDS RECEIVED

Long Beach, Cal.—Improvement of Alamitos ave. roadway and ornamental stairs leading from East Ocean ave. to high tide line, S. N. Patterson, \$4,970; A. S. Bent, \$4,544; both of Los Angeles.

Los Angeles, Cal.—By County Board of Supervisors, for improving portion of Valley road: George A. Rogers, Stimson Bldg., for grading and culverts on Section 1, \$5,500; Section 2, \$2,500; oil macadam paving, \$1.45 per ton; class A concrete, \$14 per cu. yd.; class C, \$11; reinforcing steel, 5c. per lb.; Oil Macadam Paving Co., grading and culverts, Section 1, \$9,411; Section 2, \$4,162; oil macadam paving, Section 1, \$1.75 per ton; Section 2, \$1.49 per ton; class A concrete, \$18 per cu. yd.; class C, \$16; steel, 6c.; approximately 16,466 tons of oil macadam paving will be required on Section 1, and 7,549 tons on Section 2.

Los Angeles, Cal.—Street improvements: Improving Elmyra st., H. H. Curtis, 30c. per lin. ft. for cement curb, 9.07c. per sq. ft. for sidewalk; Paul H. Ehlers, 29.07c. and 9.07c.; David Joy, 33c. and 10.05c.; Bonita pl., F. E. Low (a) \$2.40 per lin. ft. for grading and graveling complete, (b) 37c. per lin. ft. for cement curb, (c) 18.05c. per sq. ft. for cement gutter, (d) 34c. per sq. ft. for vit. block gutter; H. O. Richwine, (a) \$3, (b) 37c., (c) 17c., (d) 35c.; M. S. Cummings, (a) \$2.49, (b) 39c., (c) 19c., (d) 47c.; L. N. Davies, (a) \$2.35, (b) 38c., (c) 18c., (d) 40c.; T. F. White, (a) \$2.35, (b) 39c., (c) 18c., (d) 45c.; A. W. Beesmyer, (a) \$2.21, (b) 38c., (c) 18c., (d) 50c.; improving Alta st., H. H. Curtis, 34c. per lin. ft. for cement curb, 13c. per sq. ft. for sidewalk, 50c. per sq. ft. for asphalt curb; improving Ave. 18, Paul H. Ehlers, \$29.7c. per lin. ft. for cement curb, 9.7c. per sq. ft. for sidewalk; David Joy, 35c. and 11c.; P. Heim, 34c. and 12½c. and \$1.50 per lin. ft. for asphalt wearing surface for curbs.

Brooklyn, N. Y.—Paving with asphalt on concrete foundation Blake ave., from Van Siclen ave. to Logan st., as follows: (a) Barber Asphalt Paving Co., 30 Church st., New York City, \$28,391; (b) Cranford Co., 52 9th st., Brooklyn, \$27,217; (c) Uvalde Asphalt Co., 1 B'way, New York City, \$25,147; and (d) Borough Asphalt Co., Metropolitan ave. and Newtown Creek, Brooklyn, \$24,935 (awarded contract); 14,084 sq. yds. asphalt pavt. (5 years' maintenance), a \$1.02, b 88c., c 84c., d 82c.; 1,969 cu. yds. concrete for pavt. foundation, a \$5, b \$5.40, c \$4.75, d \$4.85; 1,030 lin. ft. new curb, set in concrete, a 94c., b 95c., c 90c., d 89c.; 5,840 lin. ft. old curb, reset in concrete, a 55c., b 55c., c 52c., d 50c.

Brooklyn, N. Y.—By Department of Parks, for repaving asphalt pavement on a concrete foundation the roadway of Eastern Parkway extension and Glenwood ave; Barber Asphalt Paving Co., 30 Church st., \$8-

305; Uvalde Asphalt Paving Co., 1 Broadway, \$7,305; the Cranford Co., 52 9th st., Brooklyn, \$8,662.

New York, N. Y.—Regulating, grading, setting curbstones, flagging the sidewalks, building approaches and placing fences in the following streets: (a) Cromwell ave., Jerome ave. to Macombe road, (b) Boston road, White Plains road to north line of city, (c) West 176th st., Aqueduct ave. to Popham ave., (d) regulating, grading, setting curbstones, flagging the sidewalks, laying cross walks, building approaches and drains, etc., and placing fences in Mt. Vernon ave., East 233d st. to northerly boundary line of the city, (e) constructing sewers and appurtenances in Walker ave., Westchester sq. and covering streets, in Benson ave., Westchester sq. and Walker ave.; Overing st., Westchester ave. and Walker ave.; St. Peter's ave., Westchester ave. and Walker ave.; Rowland st., Westchester ave. and St. Raymond ave.; Zerega ave., Westchester ave. and Glebe ave.; Tratman ave., Zerega ave. and Benson ave.; Frisby ave., Zerega ave. and Walker ave.; Glebe ave., Rowland st. and Overing st.; McClay ave., St. Peter's ave. and Benson ave.; J. B. Malestesta, (a) \$16,676, (b) \$220,502, (d) \$40,449; Thos. F. Murray, (a) \$15,534; P. J. Hane Contracting Co., (a) \$16,393, (c) \$9,954; Antonio Cegrelli, (a) \$15,722, (c) \$10,097; J. C. Voorhees, (a) \$17,860, (c) \$9,187; S. Amanna, (a) \$22,065, (c) \$8,914; P. J. Duffy, (a) \$18,583, (c) \$9,231; Standard Construction Co., (a) \$18,224, (c) \$8,234; L. J. Moran, (a) \$19,199, (b) \$252,747, (c) \$9,517, (e) \$71,898; M. Di Menna Contracting Co., (a) \$15,719; Jas. V. Trovissi, (d) \$30,518; J. C. Rogers, Jr., (b) \$240,082, (d) \$43,310; Lamurea Contracting Co., (b) \$222,201, (c) \$8,676; Venton Contracting Co., (b) \$243,447, (e) \$75,689; Godwin Construction Co., (b) \$247,882; C. W. McDonald, (b) \$239,476; W. F. Murray, (b) \$276,672, (e) \$79,229; Alegro & Spalini, (b) \$250,228; J. Damina (c) \$8,574; S. Purificago, (c) \$8,270; Geo. M. Dunn, (e) \$64,592; Leahy Contracting and Construction Co., (e) \$66,934; Standard Construction Co., (e) \$76,048; Melrose Construction Co., (e) \$73,380; Aneta Construction Co., (e) \$66,927; Alamo Construction Co., (e) \$67,480; S. Amanna & Lyons, (e) \$68,447.

Seattle, Wash.—Fifteenth ave. N. W. and W. 65th st., grading and curbing: Hanson & Co., 4100 25th st. S. W., \$7,987; East 45th st., paving, Barber Asphalt Paving Co., \$17,661; P. J. McHugh, 3d ave. N. and Mercer st., \$16,824.56; Ind. Asphalt Paving Co., Northern Bank Bldg., \$16,969.85; wood side stop, Barber Asphalt Paving Co., \$17,661; P. J. McHugh, \$17,047.76; Ind. Asphalt Paving Co., \$16,657.37.

SEWERAGE

Phoenix, Ariz.—Bids will be asked on \$400,000 bonds for building sewer system.

Bakersfield, Cal.—City proposes to expend about \$15,000 for sewers, to include about 1,500 ft. each of 6, 8, 10, 12, 14, 16 and 18-in. pipe.—C. B. Greely, P. O. Box 78, Engineer; H. F. Murdock, City Clerk.

Calxico, Cal.—I. B. Funk, Imperial, is preparing plans and specifications for municipal sewer system; cost, \$35,000.

De Land, Fla.—Council is considering construction of sewer system.

Galesburg, Ill.—City is considering construction of system of sanitary sewers; cost \$60,000.—Geo. Sanderson, President Board of Local Improvements.

Hoopeston, Ill.—Civil Engineer Frank Payne, Danville, has prepared plans of construction of drainage sewer system.—Robert Rodman, City Attorney.

Danville, Ind.—Citizens will soon vote on \$60,000 to \$75,000 bonds for construction of sanitary sewer system.

Mount Vernon, Ia.—Council is considering installation of sanitary sewer system.

Nevada, Ia.—Council has asked plans of installation of sewer system and disposal plant.

Auburn, Me.—City has awarded \$24,000 sewer bonds to Hayden, Stone & Co.

Albert Lea, Minn.—Plans are being prepared by City Engineer Barneck for sewer on William and other streets; cost \$17,696.

Joplin, Mo.—Council will consider ordinance authorizing election on \$50,000 bonds for construction of septic tank sewerage system in South Joplin.—J. B. Hodgdon, City Engineer.

Lincoln, Neb.—City Engineer Adna Dobson will prepare estimate of cost and plans for sewer in District No. 107.

Sparks, Nev.—Louis C. Kelsey, 250 3d st., Portland, Ore., has been selected to design and supervise construction of sanitary sewer system.

Matawan, N. J.—Installation of sewer system is being considered.—J. P. Lloyd, Chairman Committee.

Corona, N. Y.—City is considering construction of sewer system. D. W. Foley is interested.

Frankfort, N. Y.—Cost of piping for proposed sewers has been estimated at \$55,608, and for disposal plant at \$28,769.

Hastings-on-Hudson, N. Y.—State Board of Health has approved plans of Ward, Carpenter & Co., of Tarrytown, for construction of sewer system; work will consist of approximately 19,000 lin. ft. of sewers, with small pump house and pumping plant.

Richmond Hill, L. I., N. Y.—Plans are now being prepared by John H. Weinberger, Ch. Engr. of Queens Borough, Sewer Dept., for proposed sewage disposal plant; contract will be let in spring.

Seacliff, L. I., N. Y.—Plans will be prepared by Clyde Potts, 30 Church st., New York City, for proposed sewer system and disposal plant.

Charlotte, N. C.—Water Commissioners have recommended to Board of Aldermen extension of sewer system.—Joseph Firth, City Engineer.

Durham, N. C.—Board of Aldermen will petition General Assembly of North Carolina for authority to vote on \$300,000 bonds for extension to sewer system.

East Liverpool, O.—Council is considering construction of sewers on the east end district; cost, about \$30,000. C. V. Beatty, Director Public Service.

Grand View, O.—Citizens have voted \$50,000 bonds to install sewerage and water system; village plans to lay pipes to Columbus sewage disposal plant and secure contracts with city for use of its improvements.

New Philadelphia, O.—Council has adopted resolutions for construction of sewers and sewage disposal plant.

Niles, O.—Council has decided to construct four miles of sanitary sewers in District No. 4.

Duncan, Okla.—Citizens will vote on \$45,000 bonds in January for construction of system of sanitary sewers, including disposal plant, and for extension of the present water works system.—W. L. Benham, 714-716 Campbell Bldg., Oklahoma City, Consulting Engineer.

Shawnee, Okla.—City will construct lateral sewers; bids asked; cost, about \$5,000.

Baker City, Ore.—Board of Commissioners has ordered construction of sanitary sewer in 6th st.

Gresham, Ore.—Sewerage system will be installed under direction of Consulting Engineer Louis C. Kelsey, 250 3d st., Portland.

Carrick, Pa.—Wm. McClurg Donley has completed and filed with the State Dept. of Health plans for 1½ miles of trunk sewer connecting Boroughs of Carrick, St. Clair and Mt. Oliver, and leading to disposal plant.

Collingdale, Pa.—Sewer Committee has recommended erection of sewage disposal plant at cost of \$50,000.

South Bethlehem, Pa.—Council has engaged under special contract R. E. Neumeyer, Borough Engineer, to prepare surveys, plans, designs and specifications for a sewage disposal plant, to be ready July 1, 1911.—Thomas Haney, Borough Secretary.

CONTRACTS AWARDED

Birmingham, Ala.—Installing \$300,000 sewer to J. W. Gurley & Co., Mobile.

Los Angeles, Cal.—Constructing sewer in Western ave., to John Genilla, at \$9,250; sewer work in Hope st., to John Balch & Co.; improving Ross Court, to Jones Bros., at \$3.25 per lin. ft. for grading and graveling, 33c. per lin. ft., cement curb, 15c. per sq. ft., cement gutter; sewer construction in Alvarado st., to Radisch & Zernlich, \$10,755.

Oakland, Cal.—Building main lake sewer, to Mery-Elwell Co., city; 36th st. sewer to same bidder, \$7,947.

Orange, Cal.—To E. R. Werdin, Los Angeles, for outfall sewer system; about \$16,000.

Atlanta, Ga.—To Chester A. Dady, Brooklyn, N. Y., to construct Peachtree disposal plant, \$195,363. Hering & Fuller, 170 Broadway, New York, Consulting Engineers; R. M. Clayton, City Engineer.

Dalton, Ga.—To Haig & Puryear, city, to construct 9 miles of additional sanitary sewer, \$28,700. H. S. Jaudon Engineering Co., Savannah and Atlanta, Ga., in charge.

Chicago, Ill.—Building sewers, to following contractors: East 104th st., Christino Tosco, 814 Des Plaines st., \$2,036; Balmoral ave., Jos. Daviano, \$3,818; Manistee ave., Thos. Burke, 4648 McLean ave., \$4,992; Phillips ave., Christino Tosco, \$3,438; N. 40th ave., Christino Tosco, \$5,519; W. 40th st., American Engineering and Construction Co., 112 S. Clark st., \$72,988.

Louisville, Ky.—Construction of sewers: Park ave. and Brook st., to R. D. Smith & Co., \$3,600; Jefferson st. and Baxter ave., to L. W. Hancock & Co., \$3,200; Green st. and Herp ave., to L. R. Figg & Co., \$3,800.

Baltimore, Md.—Wiring sewerage pumping station, East Falls ave., to Central Electric Co., \$3,526.

Philadelphia, Pa.—Erecting two operating houses for sewage disposal plant at Torresdale filtration plant to Costello & Co., \$18,725.

Waynesboro, Pa.—Installing 903 ft. of sewer in Gilberton tract, to A. R. Warner.

El Campo, Tex.—To Hicks & Lehland, El Campo, to construct sewer system, comprising 2,500 ft. of 12-in., 2,100 ft. of 8-in., 3,000 ft. of 6-in. pipe and septic tank; cost, \$3,650.—W. A. Hiddleson, City Clerk.

BIDS RECEIVED

Plainfield, N. J.—Constructing two sewage pumping plants, one at Monroe ave., the other at Plainfield ave., each consisting of motors, air compressors, ejectors and operating devices in duplicate, an air receiver with pipe connections, gates and valves complete, each unit to have capacity of 175 gals. per minute: Blaisdell Machinery Co., 90 West st., New York, N. Y., \$3,745 each; Merritt & Co., Camden, \$4,224 each, and Blackall & Baldwin Co., 39 Cortlandt st., New York, N. Y., \$3,980 each.—Andrew J. Gavett, City Surveyor.

Seattle, Wash.—Sewering 12th ave. N. et al., Walker & Plackay, \$30,190.75; V. Romaglia & Christopher, 6506 3d ave., \$25,420; Krogh & Jessen, \$27,265; Ferguson Construction Co., \$31,038.30; wood stave, Walker & Plackay, \$29,748.25; V. Romaglia & Christopher, \$24,889; Krogh & Jessen, \$27,265; Ferguson Construction Co., \$30,241.80.

WATER SUPPLY

Hemet, Cal.—Lake Hemet Land & Water Co. will build steel pipe line in San Jacinto Canyon and large amount of new concrete work.—W. F. Whittier, President.

Lordsburg, Cal.—Bids will be received about Jan. 15 for \$36,000 bonds for water works; bids for construction will be received about Feb. 1. Frank Latarop, Los Angeles, Engineer.—J. A. McClellan, City Clerk.

Santa Ana, Cal.—Citizens will at once vote on \$25,000 bonds to improve water supply as follows: Well, \$3,000; pump, \$16,000; work on reservoir, about \$16,000.

San Francisco, Cal.—Pine Mountain Water Co. has been incorporated, capital \$3,000,000, to own and operate water and power plants. Duncan McDuffie, W. G. Vincent, Jr., C. L. Cory and others, all of Berkeley, and C. G. Dall, San Francisco, Directors.

Stockton, Cal.—National Board of Fire Underwriters has recommended following improvements at pumping plants: Station No. 1, two additional pumps, 5,000,000 gals. capacity each; two additional boilers, 80-h.p. each and minor work; Station No. 2, connections at earliest date to at least one additional power circuit, also installation of number of 12, 16 and 20-in. mains.

Stanford, Ill.—Engineers Meluish & Broyhill, Bloomington, has estimated cost of constructing proposed system of water works at \$6,458.—W. C. Murphy, Village Clerk.

Steamboat Rock, Ia.—Town is planning to install water works system.

Hoisington, Kan.—City has sold \$200,000 water works bonds.

Scammon, Kan.—Council has decided to extend water mains.

Stafford, Kan.—City has sold \$55,000 water and light bonds to Farmers' National Bank.

Lawrence, Mass.—Water Board has voted to adopt recommendation of Morris Knowles, Consulting Engineer, Pittsburg, Pa., to install new engine at pumping station; action will be taken later on appropriating \$9,000, estimated cost of engine.

Westfield, Mass.—City is considering construction of storage system in connection with Grantville system.

Homer, Mich.—P. A. Contrue, Lansing, has prepared plans for water works system.

Easton, Minn.—Citizens have voted to erect steel tower and tank.—S. R. Johnson, City Recorder.

St. Paul, Minn.—Dabney H. Maury, Consulting Engineer Municipal Research Commission, has recommended three new wells in the low ground near Mississippi River, to be equipped with electrically-driven pumps, cost \$30,000; electric pumps for six wells just completed at McCarron's Lake; laying a 36-in. main from the high service reservoir to Dale and Front sts., and a 30-in. main from that point to Lexington and University aves.; cost \$150,000.—H. P. Keller, Mayor.

Chaffee, Mo.—Bids will be received Jan. 18 for \$26,000 bonds for water works and city hall.—J. M. Massengill, Mayor.

Edina, Mo.—Construction of water works is being considered.

Cortland, Neb.—Village is considering installation of system of water works and electric lights.

Elizabeth, N. J.—James H. Fuertes, Consulting Engineer, is locating water supply in connection with proposed municipal water plant.

Gibbsboro, N. J.—Gibbsboro Improvement Association is interested in proposed installation of water works plant.

Raton, N. M.—G. H. Webster, Jr., Denver, Colo., is completing arrangements for the construction of a 500,000-gal. reservoir, to be lined with cement, and 76,000 ft. of pipe, to bring water from Cimmanoncito River to Raton; distance, 7 miles.

Lockport, N. Y.—Bids will be asked for building drains and water pipes in three streets.

Asheville, N. C.—Buckeye Water Co. will lay additional pipe lines and construct storage reservoir.

Charlotte, N. C.—Water Commissioners have recommended to Board of Aldermen construction of pipe to Catawaba River to furnish additional water supply, about 10,000,000 gallons daily; cost, \$275,000 to \$300,000.—Joseph Firth, City Engineer.

Durham, N. C.—Board of Aldermen will petition General Assembly for authority to vote on \$500,000 bonds for purchase and improvement of water works.

Jonesboro, N. C.—White & Platt, Consulting Engineers, Durham, are preparing plans for \$25,000 water works plant.

Statesville, N. C.—J. C. Steele desires prices, delivered, on 2,500 ft. of 4-in. water main, 2,500 ft. of 6-in. and 1,000 ft. of 4-in. sewer mains.

Sugar Creek, O.—Bids will be received about Feb. 1 for construction of water works.—L. E. Chapin, Canton, Engineer; W. A. Hahn, Village Clerk.

Ada, Okla.—Citizens have voted bonds for water works extensions.

Lamont, Okla.—Citizens will again vote on \$17,000 bonds for construction of water works.—W. F. Porter, City Clerk.

Oklahoma City, Okla.—Citizens will vote Jan. 10 on \$1,225,000 bonds to carry out recommendations of Dr. Alexander Potter, New York, for adequate water system.

Silverton, Ore.—City will expend about \$50,000 for gravity system of water works and \$20,000 for sewers, if citizens vote in favor of same.—C. H. Green, Spokane, Wash., Engineer; S. E. Richardson, City Recorder.

Huron, S. D.—Bids will be received about Feb. 1 for the construction of water works, including 750,000-gal. concrete reservoir, 200,000-gal. elevated tank, a 1,400-gal. per minute pumping plant; alternate bids will be received on steam, oil engine or gas producer plant; cost \$40,000.—L. P. Wolff, St. Paul, Minn., Consulting Engineer.

Austin, Tex.—Citizens rejected all bids for construction of reinforced concrete filtering trenches; cost, about \$10,000.—M. C. Welborn, Engineer-in-Charge; G. S. Iredell, City Engineer.

Elkhart, Tex.—Citizens will vote on bonds for construction of water works for fire and domestic purposes; nearby spring will be utilized for water supply; will build water tower.

Fort Worth, Tex.—Engineering Board has recommended immediate repair and improvement of Holly pumping station, cost \$67,500; erection of filter beds and settling basin, capacity 3,000,000 gals., \$60,000; early establishment of southside artesian field and minor improvements, \$6,300.—T. J. Powell, Commissioner Water, Streets and Light.

Rusk, Tex.—Citizens have voted bonds for construction of water works.

Midvale, Utah.—Salt Lake County Water Co. has asked for 50-year franchise from Council.

Norfolk, Va.—Preliminary plans have been prepared by Engineers W. K. Palmer Co., Dwight Bldg., Kansas City, Mo., for improvement and enlargement of water works.

Leavenworth, Wash.—Citizens have voted bonds for water system.

Port Townsend, Wash.—City will construct extension to water main.—Geo. Anderson, City Clerk.

Basin, Wyo.—Preliminary plans are being prepared by Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., for proposed water works.

Upton, Wyo.—Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., are preparing preliminary plans for water works plant.

CONTRACTS AWARDED

Chipley, Fla.—To Moore & Gammon, city, to rebuild water works; cost, \$20,000.

Huntington, Ind.—Laying 1,700 ft. of trunk sewer in 7th st. to Amos Tramor, \$8,500.

Youngstown, O.—To L. Adavasio, city, for building concrete work and removal of earth in connection with building of new dam and reservoir for Commercial Water Co.; total cost will be \$300,000.

Stillwell, Okla.—To Southwestern Engineering Co., Oklahoma City, for construction of water works.

Richmond, Va.—Cleaning out the new reservoir to A. W. Maynard & Co., \$6,294.
Walla Walla, Wash.—To Gilbert Hunt Co., city, for furnishing 6,000 ft. of 20-in. steel water main, \$5,990.

BIDS RECEIVED

Cimarron, N. M.—Construction of gravity system of water works, Cooke-Gregory Eng. Co., Joplin, Mo., lowest bidder, as follows: 13,350 lin. ft. 8-in. wood stave pipe, complete, 44.5c.; 23,560 lin. ft. 6-in. wood stave pipe, in place, 36c.; 1,350 cu. yds. excav. in reservoir, 40.5c.; 200 cu. yds. concrete, \$6.50; 130 cu. yds. ground clay puddle, \$1.10; 4,565 lbs. cast-iron pipe, 3.5c.; 855 lbs. special castings, 5.75c.; 12,973 lin. ft. 8-in. wood stave pipe, complete, 55c.; 12,380 lin. ft. 6-in. wood stave pipe, in place, 44c.; 7,455 lbs. special air trap, 5.75c.; total, including valves, hydrants, etc., \$32,329. Total of other bidders: Midland Con. Co., Ft. Scott, Kan., \$36,730; Hibbs Hardware Co., Raton, N. M., \$37,458; Marshall Bros., Las Animas, Colo., \$40,605; S. B. Morrison, Denver, Colo., \$41,280; McKay & Reed, Salt Lake City, Utah, \$45,198; Westcott-Doan Invmt. Co., Denver, Colo., \$45,067; MacArthur Bros. Co., Anecipo, Ill., \$45,805; P. O'Brien P. Co., Denver, Colo., \$46,938; W. D. Lovell, Minneapolis, Minn., \$46,958; T. A. Hayden, Santa Fe, N. M., \$49,576; H. B. Ikler, Glenwood Springs, Colo., \$43,000.—T. W. Jaycox, Denver, Engineer.

Fort Crook, Neb.—Construction of reservoir and well, J. W. Turner Improvement Co., 309 Youngerman Bldg., Des Moines, Ia., lowest bidder, \$14,000 for reservoir and \$5,000 for well.

Lincoln, Neb.—Furnishing water pipe: 170 tons of 16-in., 35 tons of 12-in., 150 tons of 6-in., 75 tons of 4-in. and five tons of specials, class C standard specifications: U. S. Cast Iron Pipe and Foundry Co., Chicago, Ill., \$10,645; Dominick Pipe Co., Kansas City, \$10,814; American Cast Iron Pipe Co., Scarritt Bldg., Kansas City, Mo., \$10,464.—James Tyler, Water Commissioner.

Portland, Ore.—By Water Board for 200 fire hydrants: Glamorgan Pipe and Foundry Co., \$7,000; J. Wood Iron Works Co., \$7,950; Ludlow Valve Mfg. Co., \$8,040; R. D. Wood & Co., \$8,200; Caldwell Bros. Co., \$8,296; Eddy Valve Co., \$8,700; Phoenix Iron Works, \$6,900.—D. D. Clarke, Chief Engineer Water Department.

LIGHTING AND POWER

Elsinore, Cal.—M. L. Gamburn and Mrs. M. A. Gardner have applied for a 50-year gas franchise from Council; will drill for natural gas.

Jacksonville, Fla.—Jacksonville has purchased site for erection of proposed power house.

Indianapolis, Ind.—Southern Indiana Power Co. has been incorporated, capital \$800,000, to build and equip power plants for generating and distribution of electricity for lighting and power purposes. Fred E. Matson, Thos. N. Stillwell and Wm. J. Henley are Directors.

Adair, Ia.—Town has voted to establish electric light plant at cost of \$10,000.

Atlantic, Ia.—Bids will be received about March 1 for improving the electric light and power plant and combining it with the water works; cost \$40,000.—T. E. Nichols, City Clerk.

Hamburg, Ia.—Citizens have voted to grant E. B. Hillman, of Peoria, Ill., franchise for electric light plant.

Redfield, Ia.—Installation of electric light plant is being considered.

Kansas City, Kan.—Citizens will vote Feb. 7 on \$350,000 bonds to build and equip electric light plant.

Lexington, Ky.—Fayette Lighting Co. is having plans prepared under supervision of A. H. Peck, General Manager, for electric power plant.

Crowley, La.—Council has passed resolution for improvement of the electric light plant, authorizing purchase of a 110-h.p. engine and a 150-kw. dynamo and a 75-kw. dynamo.

Browns Valley, Minn.—Citizens will vote on \$10,000 bonds for installation of electric light plant.

Fergus Falls, Minn.—City is considering installation of steam turbine or gas engine plant for electric lighting system.

Warsaw, Mo.—S. O. Morris, Continental Power & Development Co., Clinton, has purchased Arnolds mills property and will furnish electric light and power to city; power will be obtained from Niangua River.

Fallon, Nev.—Council is reported to be considering construction of electric light plant.

Gibbsboro, N. J.—Gibbsboro Improvement Association is interested in proposed installation of electric light plant.

Matawan, N. J.—Standard Gas Co. will make proposition for lighting streets.

Bolton, N. Y.—Public Service Commission has authorized Bolton Light & Power Co. to exercise franchise granted it for furnishing of electricity and also authorized company to issue \$125,000 capital stock and \$10,000 bonds for construction and equipment of plant.

Oswego, N. Y.—Mayor Fitzgibbons has been authorized to employ hydraulic engineer to examine plans for the new power house for city; plans were prepared by Timothy Buckley, of Water Department.

Carrington, N. D.—Stern Electric Co. has applied to Council for franchise to install electric light plant.

Stanley, N. D.—John I. Moore, Minot, has petitioned Council for franchise for electric light plant.

Kenton, O.—Kenton Gas and Electric Co. has requested extension of its franchise; company has given Council to understand that if extension is made a new \$65,000 plant will be built at once.

St. Mary's O.—St. Mary's Machine Co., St. Mary's, has secured contract to construct gas producing plant at electric light plant; about \$18,500.

Stillwell, Okla.—To Southwestern Engineering Co., Oklahoma City, for construction of electric light plant; cost, \$5,000.

Canyon City, Ore.—Oregon Light and Power Co. is planning to install electric plant at Magoon Lake to furnish light and power for Day Valley. W. C. Parrish, Baker City, is interested.

McKeesport, Pa.—Home Light Co. will apply for charter to furnish light and power.—Simon F. Loeb, Henry Firestone and Jacob Roth, Incorporators.

Pittsburg, Pa.—Select Council has adopted resolution introduced by Dr. Dilling, which instructs Director of Public Works to report estimated cost of constructing electric light plant.

Steelton, Pa.—Steelton Light, Heat and Power Co. is planning erection of electric plant and within next six months expect to be furnishing electric power from plant in borough.

Erwin, Tenn.—Nolichucky Power Corporation has plans and estimates for proposed water power electrical plant, to cost \$434,000.

Corpus Christie, Tex.—F. H. Lancashire, Dallas, will draw up form of gas franchise.

Fort Stockton, Tex.—Pecos County Commissioners have granted franchise to Clay Bros., San Angelo, to construct and operate electric light plant.

Georgetown, Tex.—Council has retained F. H. Lancashire, Dallas, to make plans and specifications and advise as to reconstruction of the old lighting and water plant.—R. E. Ward, Mayor.

Lexington, Va.—Rockbridge Power Corporation, John L. Rivers, Buena Vista, Engineer, has purchased water power, poles, wires, cables, etc., of Lexington Light & Power Co., and will extend lines to Lexington and operate plant.

New Market, Va.—J. D. Manor & Co. desire prices on 600-hp. producer gas plant, complete.

Roanoke, Va.—Roanoke Gas & Water Co. will purchase water gas set and 75,000-ft. gas holder during year.

Aberdeen, Wash.—Citizens Lighting and Power Co. will ask for franchise to furnish light and power.

Martinsburg, W. Va.—Martinsburg Power Co. will erect brick addition.

Bloomer, Wis.—Bloomer Electric Light and Power Co. has been incorporated to supply village with electric light and power; capital \$25,000.

Lena, Wis.—United States Manufacturing Co. will purchase producer gas plant and engine in near future.

Prairie du Sac, Wis.—Wisconsin River Power Co. is considering the construction of power dam.

Basin, Wyo.—Preliminary plans are being prepared by Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., for proposed electric light plant.

Upton, Wyo.—Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., are preparing preliminary plans for electric light plant.

CONTRACTS AWARDED

Elmo, Col.—Lighting streets during year, to Pacific Gas and Electric Co., only bidder, \$6.60 each for 16-c.p. lights per year and \$84 for each 2,000-c.p. light.

Jackson, O.—Improving electric light plant: To Ball Engine Co., for engine; to Scioto Valley Supply Co., heater and pumps; to Ft. Wayne Electric Works, for generator, switchboard and street lighting outfit.—Capitol Eng. Co., 48-50 N. Third St., Columbus, O., Engineers.

Brattleboro, Vt.—Village has voted to make 10-year contract with Twin State Gas and Electric Co. for 100 lamps to burn all night at \$20 per lamp per year.

Hoquiam, Wash.—Five-year lighting contract, to Grays Harbor Gas Co., by City Council; contract calls for installation of

boulevard gas posts erected on the main streets; outskirts will be lighted by Tungsten lamps.

Winnipeg, Man., Can.—Furnishing overhead line supplies for the Power Distribution System: To Northern Electric & Mfg. Co., Ltd., for western cedar poles, \$16,376; cross-arms, \$109; hardware supplies, \$2,129; and pins and brackets, \$195. To the Steel Co. of Canada, Winnipeg, Man., for 8,000 machine bolts, \$700, and for guy wire, \$471.

FIRE EQUIPMENT

Stockton, Cal.—National Board of Fire Underwriters has recommended purchase of following equipment: Two first-class engines and one second-class, auto chemical engine for auxiliary squad, auto combination chemical and hose wagons for three companies, either 3-horse hitch and quick-raising mechanism for present ladder truck or auto 75-ft. quick-raising aerial truck, chief's auto, turret pipe for hose wagon No. 2 and minor equipment.

San Francisco, Cal.—Fire Commissioners are considering erection of fire station on Brazil ave.

Augusta, Ga.—Fire Committee has recommended purchase of Webb combination auto engine and hose wagon for new engine house.

Gridley, Ill.—Bids will be received for purchase of 300 ft. of 2-in. fire hose.—C. R. Rowley, Village Clerk.

Belmont, Ia.—City will purchase quantity of hose in near future.—M. A. Holtzbauer, Chief.

Kansas City, Kan.—Citizens will vote Feb. 7 on \$50,000 bonds to build central fire headquarters.

Chicopee, Mass.—Special Aldermanic Committee is favorable to purchase of one or more motor-driven trucks for fire department.

Eveleth, Minn.—Council is considering erection of fire hall.

Meridian, Miss.—City is planning to erect three fire stations and repair central fire station.—I. F. Ettridge, Inspector.

Jefferson City, Mo.—City is considering purchase of 1,000 ft. of fire hose.—Geo. N. Winston, City Clerk.

Plainfield, N. J.—Fire Chief Doane has recommended purchase of either steam or motor fire engine and placing underground of at least one section of overhead wires during year.

Manchester, N. H.—Erection of fire telegraph station is being considered.

Akron, O.—Council has passed ordinance to issue \$3,300 bonds to purchase fire chief's auto wagon and chemical engine.—Dow W. Horter, Clerk.

Cleveland, O.—Public Safety Director Hogen is planning to erect two fire stations on east side and two on west side.

Norwalk, O.—Board of Control will ask for new bids for furnishing combination hook and ladder truck.—Mayor Venus, President.

Hood River, Ore.—Fire department is raising funds for purchase of new equipment.

East Providence, R. I.—Town is considering purchase of auto fire truck for Wall-market district; \$5,000 available.

Pawtucket, R. I.—Committee on City Property will investigate matter of site for fire station in South Woodlawn.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$120,000 bonds for fire and police departments.

Spokane, Wash.—Council has decided to erect proposed Altamont fire station at 17th ave. and Pittsburg st.

Random Lake, Wis.—Citizens have voted \$4,000 bonds for purchase of engine, hose cart and 1,500 ft. of hose; also for erection of fire station.

CONTRACTS AWARDED

Chico, Cal.—Furnishing second size steam fire engine, Metropolitan type, to American-La France Co., Elmira, N. Y., \$5,750.

Oakland, Cal.—Furnishing temporary cable for underground system for fire and police telegraph, to Standard Underground Cable Co., 37.7c. per ft.

Boston, Mass.—Furnishing 1,250 ft. 2½-in. 4-ply "Maltese Cross" rubber fire hose, coupled in 50-ft. lengths, capped ends, to Gutta Percha and Rubber Manufacturing Co., \$1.25 per ft.; to Combination Ladder Co., for 1,250 ft. "White Anchor" rubber fire hose, \$1.49.

Dallas, Tex.—Furnishing fire hose: 2,000 ft. Paragon brand, \$1.15 per ft., to Eureka Fire Hose and Manufacturing Co.; 500 ft. Bay State Jacket brand, \$1 per ft., to Boston Woven Hose and Rubber Co.; 500 ft. Goodrich brand, \$1 per ft., to the Chicago Fire Hose Co.

Weatherford, Tex.—Building fire station and city hall, to Johnson Sons & Co.

BIDS RECEIVED

New York, N. Y.—Furnishing and delivering two gasoline propelled and pumping engines; Webb Fire Apparatus, 50 West Broadway, city, \$16,500; Watrous Fire Engine Co., \$17,000.

Rochester, N. Y.—Furnishing 2,800 ft. of cable for Fire Department, Standard Underground Cable Co., only bidder, 27.8c. per foot.

BRIDGES

Corcoran, Cal.—Board of Supervisors of Tulare County, Visalia, have decided to build 600-ft. trestle bridge over Tule River.

Fullerton, Cal.—Bond election will be called on \$10,000 for construction of a concrete bridge.

Hanford, Cal.—Board of Supervisors of Tulare County have decided to construct 600-ft. trestle over Tule River.

Pasadena, Cal.—Bids are being taken by Long & Cary, 16 South Raymond ave., for construction of a 350-ft. concrete bridge across Arroyo Seco from Prospect Square to Arroyo st.; plans have been drawn by Engineers Williams & Nishkian, 423 Chamber of Commerce Bldg., Los Angeles.

Santa Ana, Cal.—Plans for the construction of highway bridge at Newport Bay have been prepared by Engineer S. H. Finley.

Macomb, Ill.—Special Committee McDonough County Board of Supervisors has recommended construction of proposed bridge.

Normal, Ill.—Board of Local Improvements is considering construction of proposed Sugar Creek bridge.—Melluish & Broyhill, Bloomington, Engineers.—J. H. Keyes, City Clerk.

Great Bend, Kan.—Liberty Township has voted bonds to build bridge across Arkansas River at Dundee.

Lawrence, Kan.—City has decided to construct 46-ft. bridge over Toy Creek.

Leavenworth, Kan.—County Commissioners have adopted plans for building nothing but concrete bridges.

Fitchburg, Mass.—City Engineer T. J. Sheehan has recommended erection of new bridge at Nassau St.

Holyoke, Mass.—City Engineer J. L. Tighe has recommended gradual replacing of old bridges with new, beginning with Cabot st. second level canal bridge.

Joplin, Mo.—Council will consider ordinance authorizing election on \$40,000 bonds toward construction of viaduct along Broadway across Kansas City bottoms; total cost, \$120,000.—J. B. Hodgdon, City Engineer.

Jersey City, N. J.—Boulevard Commissioners will expend \$15,000 in improving Boulevard bridge near Pennsylvania Railroad.

Syracuse, N. Y.—William S. Manning, Engineer, is planning the construction of a 250-ft. bridge in connection with Bridge st. extension work.

Webb, N. Y.—Town is considering erection of \$2,500 bridge across Mosse River.

Akron, O.—Plans are now being prepared for erection of a concrete bridge over Erie tracks at Brewster's crossing on South Main st.—John Payne, City Engineer.

Columbus, O.—Plans are being prepared by the County Surveyor of Franklin County for construction of a bridge over Blacklick Creek to provide the extension of East Broad st.; cost \$18,000.

Germantown, O.—Montgomery County is considering erection of reinforced concrete bridge over Twin Creek; preliminary plans being made.—Ed. Moritz, Dayton, Engineer.

Portland, Ore.—Tentative plans will be prepared by Waddell & Harrington, Consulting Engineers, Kansas City, Mo., for the construction of the bridge at Ellsworth and Mead sts.; cost \$600,000.

Pittsburg, Pa.—Council is considering resolution to place \$50,000 in appropriation fund for construction of bridge from Ruth st. to Washington ave.

Reading, Pa.—County Commissioners have decided to erect rein. concrete bridge 1,400 ft. long and 56 ft. wide over Schuylkill River.

Trechlers, Pa.—Lehigh and Northampton County Commissioners are considering making of repairs and alterations to bridge across Lehigh River; cost \$2,500.—R. S. Rathbun, Allentown, Engineer.

Plain City, Utah.—County Commissioners, Ogden, have granted authority to Road Supervisor, Plain City, to erect bridge across Dick's Creek.

Fond Du Lac, Wis.—Plans for steel and concrete bridge to be erected across De Neveu Creek on East Scott st. are being prepared by Assistant City Engineer A. H. Pitz.

Vancouver, B. C., Can.—Cost of the construction of concrete bridge at the foot of Burrard ave., to Kitsilano has been estimated, at \$922,400.—N. A. Clement, City Engineer.

CONTRACTS AWARDED

San Diego, Cal.—To Knight & Hyde, for constructing bridges as follows on coast road between Oceanside and Capistrano: Santa Margarita, \$7,765; San Onfre, \$6,016, and San Mateo, \$6,939.

Salmon, Ida.—Construction of new bridge across Lemhi River, at Barracks Lake, to E. L. Emigh.

Denison, Ia.—To Lana & Co., Harlan, for building bridges in county.

Chaumont, N. Y.—Constructing substructure and fender cribs for lift bridge over Chaumont River at Chaumont, to John M. Fitzgerald, Sackets Harbor, \$5,260.

Rome, N. Y.—Constructing a highway bridge over the Erie Canal at South Washington st., to Henry Tosh & Son, Port Byron, N. Y., \$14,777.

Allentown, Pa.—To George H. Hardner, re-award for widening Hamilton st. bridge, \$25,950; Nov. 28 contract was awarded to R. T. & C. D. Stewart Construction Co., Easton, Pa.—Robert S. Rathbun, County Engineer.

Providence, R. I.—Lumber for bridge work, to William M. Harris & Co., \$27.20 per M; bridge piles, to H. E. West, Seekonk, 15½c. per ft.; other bidders: C. A. Card, Groton, Conn., 20c. per ft.; John McLaughlin, Cumberland, \$6.50 each, and Alfred F. Morse, Boston, \$5.75 each.

MISCELLANEOUS

Napa, Cal.—Council is considering erection of garbage crematory.—O. H. Buckman, City Engineer.

Redlands, Cal.—City Trustees will call election on \$80,000 bonds for park purposes.

Denver, Col.—Appropriation of \$90,000 for sprinkling streets during year has been asked for by Thomas Phillips, Superintendent Highway Department; purchase of 10 new sprinklers is proposed.

Pensacola, Fla.—Bids will be received Jan. 16, noon, for \$250,000 improvement bonds.—John A. Merritt, Chairman, Board of Bond Trustees.

Denison, Ia.—Crawford County Supervisors will soon let contract for erection of \$25,000 building for county poor.

TOO LATE FOR CLASSIFICATION

STREET IMPROVEMENTS

Los Angeles, Cal.—Committee of Supervisors, with I. B. Noble, County Surveyor, will investigate question of building one mile and a half of macadam highway.

Elkhart, Ind.—Board of Public Works has decided to pave portions of Jackson, Visalia and three other streets.

South Bend, Ind.—Paving of Michigan st. with asphalt at cost of \$250,000 is being considered.

Corning, Ia.—Council has decided to pave Davis ave., Adams and 8th sts.; work includes 2,550 ft. comb. curb and gutter; 247 ft. gutter to be laid to old curb; 14,133 yds. brick paving and 292 yds. concrete alley approach paving.—Theo. S. De Lay, Creston, Engineer in Charge; A. T. Wheeler, Mayor.

Wilkes-Barre, Pa.—Council has passed ordinance for paving Park ave., between Northampton and Hazle Sts.—F. H. Gates, City Clerk.

Tacoma, Wash.—Widening Pacific ave., to Keasel Construction Co., \$35,948.

CONTRACTS AWARDED

Bluffton, Ind.—By Board of County Commissioners for four gravel and stone roads in this county to Wilson A. Woodward, Ossian, for Calvin Kunkel, Orlando Kizer and the M. N. Newman roads, \$10,040; to Charles W. North, city, William Spade road, \$4,960.

Muncie, Ind.—To Wm. Birch, city, for building 2 mi. of brick roadway on Middletown pike; \$42,000.

SEWERAGE

South Bend, Ind.—Board of Public Works is considering installation of sewer in downtown district.

Vincennes, Ind.—Plans for construction of sewer system are being discussed.

Grand Rapids, Mich.—Health Officer Slemmons has recommended immediate construction of sewer in College ave.

Grand Rapids, Mich.—Council has decided to issue \$25,000 sewer bonds.

Kansas City, Kan.—Citizens will vote Feb. 7 on \$100,000 bonds to build auditorium annex to city hall; \$50,000 bonds to build two incinerating plants and \$50,000 to build dikes and boat landing on levee.

Leominster, Mass.—Frank Lent, of Leominster, is preparing plans for \$150,000 town hall.—P. H. Killelea and Geo. M. Kendall, Building Committee.

Chaffee, Mo.—Bids will be received Jan. 18 for \$26,000 bonds of city hall and water works.—J. M. Massengill, Mayor.

Jefferson City, Mo.—Cole County is considering erection of brick jail.—C. H. Dirckx, County Clerk.

Schenectady, N. Y.—Dr. Charles F. Clowe, Health Officer, has recommended construction of garbage disposal plant.

Troy, N. Y.—Architect Wm. J. Beardsley, 49 Market st., Poughkeepsie, will prepare plans for erection of proposed jail, workhouse and sheriff's quarters; cost \$111,680.—R. N. Palmer, Clerk Board of Supervisors Rensselaer County.

Muskogee, Okla.—Mayor McGarr will enter into negotiations with Expert Engineer Alexander Potter, of New York City, for preparation of plans and specifications for modern garbage disposal system.

Dumont, Pa.—Borough is considering bond issue for improvements.

Pittsburg, Pa.—City has awarded \$4,878,000 improvement bonds to National City Bank of New York, and N. W. Harris & Co., of New York.

Pittsburg, Pa.—Bureau of Parks has asked for following appropriations: Additional land for Highland Park, between the present boundaries of the park and Allegheny River, and adjoining the Hights Run Bridge, \$150,000; additional land adjoining the Murdock ave. entrance to Schenley Park, \$45,000; improvements to Riverview Park, \$16,000; golf grounds and shelter house in Schenley Park, \$73,795; brick building for stable and supply house for parks, \$50,000; grading, sewerage, curbing and macadamizing road from Beacon st. to connect with park road, \$81,000; artesian wells, \$1,000; music for summer concerts, \$10,000.

Sioux City, S. D.—Architect Jos. Schwartz has completed plans for erection of jail and sheriff's residence for Minnehaha County; cost \$50,000.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$120,000 bonds for police and fire departments.

Merrill, Wis.—Committee of the Lincoln County Board is repairing plans for county jail.

CONTRACTS AWARDED

Oakland, Cal.—Building levee in Key Route basin, to Pacific Coast Dredging and Reclamation Co., 5.4c. per cu. yd.; total cost about \$13,000.

Anderson, Ind.—Daniels & Lyst, city, have received contract for dredging small stream near Scottsburg, \$20,000.

Evansville, Ind.—To Henry Korff, Jr., for street sweeping for 1911 by Board of Public Works, 19½c. per 10,000 sq. ft.

Ventnor City, N. J.—To John W. Cooney, Atlantic City, for jetty; to Ingersoll & Weeks, Atlantic City, for pier, \$24,393, and to Wilbert Beaumont, Atlantic City, for building, \$26,000.

Providence, R. I.—Improving Providence river and harbor by dredging channel approach to the Coastwise Dredging Co., Norfolk, Va., about \$200,000.

Weatherford, Tex.—Building city hall and fire station, to Johnson, Sons & Co.

Pelham, N. Y.—Following propositions will be voted on Jan. 11: Village of North Pelham will vote as to whether village will enter into contract with Pelham and Pelham Manor to extend its sewer through Pelham and Pelham Manor to disposal plant, and also whether \$15,000 shall be expended in building extension; Pelham will vote as to whether it will also enter into contract with Pelham Manor to build sewer to extend to the disposal plant and if it shall allow North Pelham to go through village with its sewer system; Pelham Manor will vote to allow the village of North Pelham and Pelham to extend their sewer system into Pelham Manor to connect with disposal plant.

Quakertown, Pa.—Albright & Mebus, Land Title Bldg., Philadelphia, are preparing plans for sewerage system and disposal plant; cost, \$125,000.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$40,000 bonds for storm sewers.

Pecos, Tex.—Citizens will vote Jan. 30 on \$25,000 sewerage bonds.

The FLASHLITE System

A Combination Police and Fire Box, with three powerful red lenses that are visible from three directions for at least 500 yards in the day-time and for miles at night.

The boxes are located in each district, so at least one light is always within line of vision of the officer on that beat.

The telephone part of the equipment is of the best quality. All noisy lines and interruptions are completely removed.

The Patrol Flashlite system has passed the experimental stage. All installations are giving satisfactory results. The patrol boxes are heavily constructed and are neat in appearance. The outer door forms a moisture proof covering when closed.

The Patrol Flashlite system can be purchased outright and at a reasonable price, or a complete system may be installed and maintained, on a rental basis. Write us for details.



Calls the patrolman, sends in fire alarms, registers the roundsman on a ticker tape at headquarters, calls the patrol wagon, and has a telephone.

FLASHLITE

The distinctive feature of this apparatus is the FLASHLITE idea. It enables police headquarters, at any time of the day or night, to reach any roundsman instantly. Simply throwing a little switch lights powerful red lamps on any beat or all over the city. This signals the officers to come to the telephone for instructions.

RESERVES

Just think of it—you could assign your station reserves to regular beats and still be able to reach them as promptly as though they were asleep in the next room. The Patrol FLASHLITE System more than trebles the efficiency of your force.

FIRE ALARMS

The illustrations show the location of the public key compartment. The hook is pulled in the usual manner—nothing new or confusing. The police are also notified along with the fire department. The lamp lights when the alarm is sent in and is extinguished when the fire chief replaces the broken glass. Illuminated flash-light pilots fire department.

REGISTRATION

Roundsmen's reports are automatically printed on a ticker tape at headquarters, by simply pulling the hook—the fire alarm circuit does not operate until the glass is broken. The telephone is not used in reporting. Constant attendance is not required at the headquarters' switchboard—the automatic registrations become indisputable records of each beat.

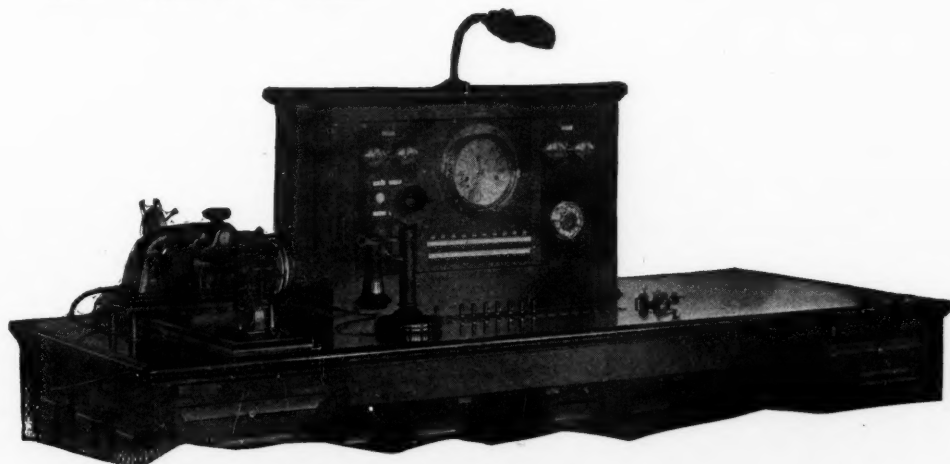
WAGON CALL

The wagon is called by depressing the button over the receiver, after the registration hook has been pulled. No telephoning necessary.

TELEPHONES

The talking apparatus is the standard Dean Electric Indestructible equipment. Dean telephone apparatus is well known all over the world by up-to-date telephone men. Ask any Independent telephone man. The Dean Electric Company is an old established concern—see Dun's or Bradstreet's.

SEND FOR DESCRIPTIVE BOOKLET.



Front View of Switchboard at Police Headquarters

**The Dean Electric
Company**
Elyria, Ohio, U. S. A.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREET IMPROVEMENTS				
New York	Buffalo	Jan. 6, 11 a.m.	Paving and repaving several streets.	Francis G. Ward, Commissioner.
Nebraska	Wymore	Jan. 10	Grading Block No. 31.	L. V. Douglas, City Clerk.
New Jersey	Hoboken	Jan. 9, 2 p.m.	Improving Eighth street.	John J. Heavey, Chm. Com. Sts.
Virginia	Roanoke	Jan. 19, noon	Constructing granolithic sidewalks.	W. L. Craft, City Clerk.
Virginia	Roanoke	Jan. 19, noon	Grading two streets.	W. L. Craft, City Clerk.
Ohio	Cincinnati	Jan. 20, noon	Improving Dayton Pike.	Fred Dreihls, County Clerk.
Oregon	Portland	Feb. 23	Constructing pavement on Jersey st.	J. W. Morris, City Engineer.
Maryland	Baltimore	Jan. 11, 11 a.m.	Repairing sheet asphalt pavement for whole city.	J. Barry Mahool, Pres. Bd. Awards.
SEWERAGE				
Minnesota	Albert Lea	Jan. 6, 7:30 p.m.	Constructing several sewers.	C. J. Dudley, City Clerk.
Missouri	St. Louis	Jan. 6, noon	Constructing 450 ft. 18-in. and 690 ft. 12-in. pipe sewer.	Maxine Reber, Bd. Pub. Wks.
Maryland	Annapolis	Jan. 17, 11:30 a.m.	Building sewer on two streets.	S. O. Tilgman, Clk. Co. Comrs.
New Jersey	Elizabeth	Jan. 16, 8:30 p.m.	Con. 570 ft. 10-in., 505 ft. 8-in. sewer pipe, calked joints, etc.	N. K. Thompson, St. Comr.
WATER SUPPLY				
Br. Col'bia, Can.	Kerrisdale	Jan. 11	Supplying valves and hydrants.	H. Floyd, C. M. C.
Texas	Fort Sam Hous'n	Jan. 19, 11 a.m.	Con. 3 reinforced concrete water troughs, etc.	P. W. Guiney, Con. Q.M.
Arizona	Douglas	Jan. 19, 1 p.m.	Con. reservoir, water mains, valves, hydrants, etc.	R. G. McArthur, Sec'y. W. W. Com.
Ohio	Newburg	Jan. 21, noon	Constructing water mains.	J. W. Shimek, Clk. Bd. of Control.
LIGHTING AND POWER				
Maryland	Annapolis	Jan. 17, 11 a.m.	Lighting sts. in Arundel County by arc or incan. elec. lamps for terms of one, two, five or ten years.	S. O. Tilgman, Clk. Co. Comrs.
BRIDGES				
Iowa	Grundy Center	Jan. 6, noon	Constructing floors and abut. for bridges, culverts, etc.	E. G. Ensminger, County Auditor.
Ohio	Galion	Jan. 7, noon	Constructing concrete culvert.	G. F. Ackerman, County Auditor.
Ohio	Defiance	Jan. 9, 2 p.m.	Constructing fill at bridge approach.	S. I. Gruner, County Auditor.
Illinois	Crete	Jan. 9, 2 p.m.	Constructing concrete bridge.	Sam Rose, Town Clerk.
Illinois	E. St. Louis	Jan. 9	Con. two 150 ft. span and two 60 ft. span concrete and st. bldgs	T. N. Jacobs, Engineer.
Indiana	Rushville	Jan. 11	Constructing concrete bridges and culverts.	J. M. Stone, County Auditor.
Nebraska	Kearney	Jan. 12	Repairing bridges and furnishing supplies.	County Clerk.
Ohio	Jefferson	Jan. 16, 1 p.m.	Constructing superstructure of bridge over Grand river.	A. V. Hillyer, County Clerk.
FIRE EQUIPMENT				
Montana	Missoula	Jan. 9, 5 p.m.	Furn. six cylin. 60 to 80 h.p. auto comb. chem. and hose wagon	Samuel Bellew, City Clerk
New York	Jamestown	Jan. 9	Furnishing fire apparatus.	S. A. Carlson.
Rhode Island	E. Providence	Jan. 21	Furnishing automobile fire truck.	W. E. Smyth, City Clerk.
MISCELLANEOUS				
Maryland	Baltimore	Jan. 11, 11 a.m.	Furn. following materials separately: lumber, sand, paving stone, broken stone, vitrified blocks, sewer pipe, asphalt blocks, Portland cement, curb stone, hardware, sewer traps, manhole frames and covers, etc.	J. Barry Mahool, Pres. Bd. Awards.

CONTRACTS AWARDED

Westernport, Md.—Construction of concrete bridge, to Nelson-Merydith Co., Chambersburg, Pa., \$4,365.

BIDS RECEIVED

Akron, O.—Mathew McCourt was lowest bidder on the Glenwood avenue sewer from Howard street to Turner avenue, \$2,030.20; also lowest bidder on Summer st. sewer from Allyn to Brown streets, \$2,560.50; on Water st. sewer, State st. to Wooster ave., M. H. O'Toole was lowest bidder, \$3,191.65.

WATER SUPPLY

Sacramento, Cal.—City Trustees have adopted specifications for steam pumping unit of City Water Works.

Atlanta, Ga.—Chief Engineer A. W. Collier has recommended installation of two vertical triple expansion pumping engines for Hemphill station and one new 20,000,000-gal. pump for river station; it is suggested that the pumps for Hemphill station should each have a capacity of 15,000,000 gal. every 24 hours; purchase and installation of two 300-h.p. water tube boilers at the river station; cost, \$10,900; enlargement of coal chute at same station; building of a rip-rap dam between island and west bank of river so that the water supply over intake pipes can be increased; purchase of additional land at Hemphill station for future coagulating basins; appropriation of \$10,000 for beautifying of the water works park; employing of chemist to be on constant duty at filter plant; tearing away of old frame stables at water works shop, on Hemphill ave., and erection in their stead of brick or concrete building.

Doerun, Ga.—Citizens have voted \$6,500 bonds for water works.—Jos. L. Dowling, Mayor.

Joliet, Ill.—New bids are to be asked by city for building water main to connect new west side well with the Western avenue water main.

Saybrook, Ill.—Contracts will soon be let by Village Board for three concrete and brick 200-bbl. cisterns.—A. C. Harper, City Attorney.

Mitchell, Ind.—S. D. Rowland has been granted franchise to supply water.

Marshalltown, Ia.—Prof. B. J. Lambert, Head, Department of Engineering, Iowa State University, Iowa City, has been employed by Council to prepare plans and specifications for proposed water works; plant will cost \$11,000 completed.

Dayton, Ky.—Council is considering two plans for establishment of municipal water

plant; one for city to buy pipes that are now being used from Union Light, Heat and Power Co. and then enter into contract with city of Newport for water; other is to contract with some pipe company to furnish pipe and have it installed at city's expense, and if water cannot be obtained from Newport to build pumping station and establish a reservoir on hills back of city. Address Mayor Quinby.

Troy, Mont.—R. E. Porterfield has been granted franchise for water works by Lincoln County Commissioners.

Grand View, O.—Citizens have voted \$50,000 bonds to install water and sewerage system; village plans to lay pipe to Columbus filtration plant and secure contracts with city for use of its improvements.

Marion, O.—Council is considering municipal ownership of water works.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$1,500,000 bonds for construction of reservoir capable of supplying city of 250,000 people.

Portsmouth, Va.—Citizens will vote on \$600,000 bonds for establishment of municipal water works system on Jan. 18.

Tacoma, Wash.—Chief Draftsman W. B. Short has recommended various extensions to distribution system.

Milwaukee, Wis.—Board of Estimate has allowed \$166,000 appropriation for extension of high and low pressure service; plans by City Engineer Poetsch.

Gleichen, Alta., Can.—Galt Engineer Co., Ltd., Winnipeg, has made preliminary survey for proposed water works; cost about \$30,000.

CONTRACT AWARDED

Glencoe, Ill.—To C. T. Bartlett, Evanston, for building 2,800 ft. 6-in. water mains, \$2,799.50.

LIGHTING AND POWER

Central City, Ia.—Fred J. Cross, Monticello, has asked town for franchise for electric light and power plant.

Rockport, Mass.—Citizens are favorable to establishment of electric plant.

Pontiac, Mich.—Eastern Michigan Edison Co. has purchased 17 acres of land near Amy, along Clinton River, and proposes to erect steam power plant to furnish commercial power for Pontiac, Mt. Clemens, Royal Oak, Rochester and Utica.

Troy, Mont.—R. E. Porterfield has been granted franchise for electric light system by Lincoln County Commissioners.

Fort Worth, Tex.—Citizens will vote Jan. 11 on \$40,000 bonds for lights.

Tacoma, Wash.—Commissioner Nicholas Lawson of Department of Light and Water has been authorized by Municipal Commission to advertise for bids for the construction of remaining eight sections of city's Nisqually power plant.

Kaukauna, Wis.—Citizens have voted to establish municipal electric light system.

CONTRACTS AWARDED

St. Paul, Minn.—To Patterson Street Lighting Co. for maintenance of gas lights, \$10.50 each, and gasoline lights, \$27.45; to St. Paul Gas Light Co. for current for ornamental lamps, \$75 each, reduction of \$15 from contract price; to same company for the overhead arcs, \$75, a reduction of \$5; underground arcs, \$90, and gas for gas lamps maintained by the Patterson Co., \$13, same as at present; to company also bridge lighting contract at present figure; contracts represent reduction of about \$9,000 from this year's prices.

Ottawa, Ont., Can.—Supplying poles and lamps for Sparks st., to Garivoch, Goddard & Co., \$2,807 for 60 poles and 300 lamps.

FIRE EQUIPMENT

Bloomington, Ill.—City is considering purchase of combination auto fire truck.—Henry Mayer, Chief Fire Department.

Woodbury, N. J.—Committee is considering purchase of fire engine.

CONTRACTS AWARDED

Lowell, Mass.—Furnishing auto for Fire Chief Hosmer, to Knox Automobile Co., \$2,000; Moody Bridge, garage agent.

Trenton, N. J.—Installation of fire alarm apparatus, to Star Electric Co., Binghamton, N. Y., \$3,085; Gamewell Co., 19 Barclay st., New York City, \$3,525 and \$4,725.

BRIDGES

Colorado Springs, Col.—El Paso County Commissioners are considering erection of concrete girder bridge near Pring.

Bridgeport, Conn.—Committee, Alderman H. J. Lavery, Chairman, has recommended rebuilding of East Washington ave. bridge.

Indianapolis, Ind.—Park Board is considering plans for \$85,000 bridge over Fall Creek at Capitol ave.

Hutchinson, Kan.—Substitution of concrete bridges in various townships of Reno County for present wooden bridges is being urged.—W. B. Harris, County Engineer.